The American Annual of Photography
AND
Photographic Times Almanac for 1888.

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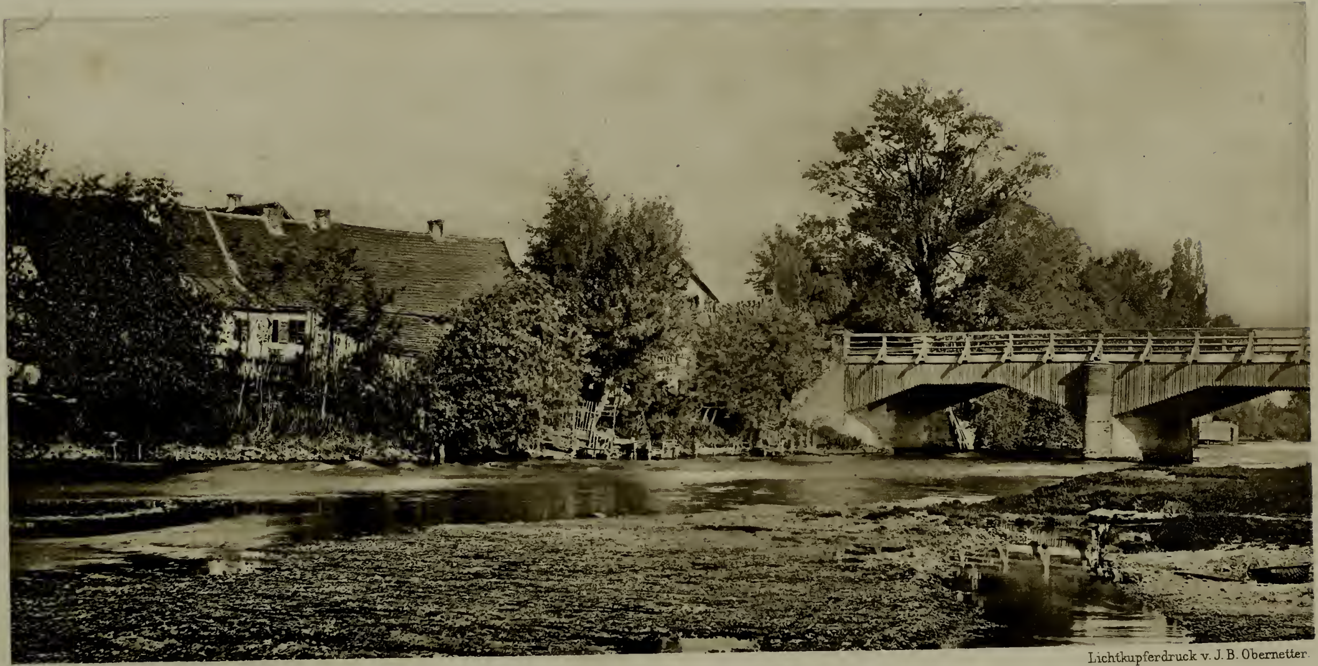

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THE AMERICAN ANNUAL OF

Photography

AND

Photographic Times

ALMANAC

FOR 1888

EDITED BY

C. W. CANFIELD

NEW YORK.
Scovill Manufacturing Company
W. IRVING ADAMS, AGT

HIRSCH, KAHN & CO.
PHOTO-SUPPLIES.
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PHOTO. TIMES PRINT.

PREFACE.

In writing the introductory word to the "Annual" for 1887, we agreed to be content if the result proved "that there was room for this addition to the number of already established Year Books." On that basis, contentment must be our lot; the result shows with abundant conclusiveness that there *was* room, for the first edition was exhausted almost immediately, and a second speedily called for and issued.

This is a most gratifying state of things, and shows that the interest in and enthusiasm for the art and practice of Photography is growing apace, and that efforts to collect and publish in compact form the accumulated experience of many minds, are appreciated.

As before, the articles have all been written expressly for the Annual, and in again making the prefatory bow to the readers of this, the second volume of what we hope will prove a long series, the editor once more acknowledges with feelings of deep obligation the kindness and interest manifested by all those who have helped to make this issue what it is. Their number is larger than before, the ground covered is naturally more extensive; our pages have had to yield to the pressure, and expand; and even then, several articles which were sent us were too late to be included. These have been published in the columns of the *Photographic Times*, and their authors are included in our thanks.

Thanks are also due to the Eastman Dry-Plate and Film Company for their charming bromide print, to E. Obernetter, of Munich, Germany, for the fine specimen of his photogravure process, to the Crosscup & West Company, of Philadelphia, and Stevens & Morris, of New York City, for the blocks they so kindly furnished for the illustrations of the "Ives process" and zinc etching, respectively, and to the Photogravure Co., of New York, for the photo-lithographic print.

For the rest, the pages must speak for themselves. Let us hope that their silent speech will gladden some, by telling of others' success along ways in which they have themselves labored—help others by showing heights still to be scaled on the road to perfection. So we set up our milestone, and on into the new year, with whatever it shall bring.

C. W. Canfield.

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ECLIPSES IN 1888.

In the year 1888 there will be five eclipses, three of the Sun and two of the Moon.

I.—*A Total Eclipse of the Moon*, January 28, visible at Washington and generally throughout North and South America, Europe, Asia, and Africa.

II.—*A Partial Eclipse of the Sun*, February 11, invisible at Washington.

III.—*A Partial Eclipse of the Sun*, July 8, invisible at Washington.

IV.—*A Total Eclipse of the Moon*, July 22, visible at Washington and generally throughout North and South America.

V.—*A Partial Eclipse of the Sun*, August 7, invisible at Washington.

THE SEASONS.

SPRING begins	March 20, 5 a.m.	AUTUMN begins	Sept. 22, 4 p.m.
SUMMER begins	June 21, 1 a.m.	WINTER begins	Dec. 21, 10 a.m.

CHURCH DAYS.

Septuagesima	Jan. 29	Easter Sunday	April 1
Sexagesima	Feb. 5	Rogation Sunday	May 6
Quinquagesima	" 12	Ascension Day	" 10
Ash Wednesday	" 15	Whitsunday	" 20
Quadragesima	" 19	Trinity Sunday	" 27
Palm Sunday	March 25	Corpus Christi	" 31
Good Friday	" 30	Advent Sunday	Dec. 2

CHRONOLOGICAL CYCLES.

Dominical Letters	AG	Solar Cycle	21
Epact	17	Roman Indiction	1
Lunar Cycle or Golden Number	8	Julian Period	6601

CHRONOLOGICAL ERAS.

THE YEAR 1888, WHICH COMPRISES THE LATTER PART OF THE 112TH AND THE BEGINNING OF THE 113TH YEAR OF THE INDEPENDENCE OF THE UNITED STATES OF AMERICA, CORRESPONDS TO—

The year 7396–97 of the Byzantine era, the year 7397 commencing on September 1st;

The year 5648–49 of the Jewish era, the year 5649 commencing on September 6th, or, more exactly, at sunset on September 5th;

The year 2641 since the foundation of Rome, according to VARRO;

The year 2635 since the beginning of the era of NABONASSAR;

The year 2664 of the Olympiads;

The year 2200 of the Grecian era, or the era of the Seleucidæ;

The year 1604 of the era of DIOCLETIAN;

The year 2548 of the Japanese era and to the 21st year of the period entitled "Meiji."

The year 1306 of the Mohammedan era, or the era of the Hegira, begins on the 7th day of September, 1888.

The first day of January of the year 1888 is the 2,410,638th day since the commencement of the Julian Period.

YEARLY CALENDAR FOR 1888.

1888.	SUNDAY.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.	SATURDAY.	1888.	SUNDAY.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.	SATURDAY.
JANUARY....	1	2	3	4	5	6	7	JULY.........	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		22	23	24	25	26	27	28
	29	30	31	..	..	..	..		29	30	31	..	..	..	..
FEBRUARY..	..	..	..	1	2	3	4	AUGUST......	..	..	..	1	2	3	4
	5	6	7	8	9	10	11		5	6	7	8	9	10	11
	12	13	14	15	16	17	18		12	13	14	15	16	17	18
	19	20	21	22	23	24	25		19	20	21	22	23	24	25
	26	27	28	29	..	..	..		26	27	28	29	30	31	..
MARCH......	..	..	..	..	1	2	3	SEPTEMBER..	..	..	..	..	..	..	1
	4	5	6	7	8	9	10		2	3	4	5	6	7	8
	11	12	13	14	15	16	17		9	10	11	12	13	14	15
	18	19	20	21	22	23	24		16	17	18	19	20	21	22
	25	26	27	28	29	30	31		23	24	25	26	27	28	29
	..	..	..	..	..	..	..		30	..	..	..	..	..	..
APRIL.... ...	1	2	3	4	5	6	7	OCTOBER....	..	1	2	3	4	5	6
	8	9	10	11	12	13	14		7	8	9	10	11	12	13
	15	16	17	18	19	20	21		14	15	16	17	18	19	20
	22	23	24	25	26	27	28		21	22	23	24	25	26	27
	29	30	..	..	..	..	..		28	29	30	31	..	..	..
MAY........	..	..	1	2	3	4	5	NOVEMBER..	..	..	..	..	1	2	3
	6	7	8	9	10	11	12		4	5	6	7	8	9	10
	13	14	15	16	17	18	19		11	12	13	14	15	16	17
	20	21	22	23	24	25	26		18	19	20	21	22	23	24
	27	28	29	30	31	..	..		25	26	27	28	29	30	..
JUNE.........	..	..	..	..	..	1	2	DECEMBER...	..	..	..	..	..	..	1
	3	4	5	6	7	8	9		2	3	4	5	6	7	8
	10	11	12	13	14	15	16		9	10	11	12	13	14	15
	17	18	19	20	21	22	23		16	17	18	19	20	21	22
	24	25	26	27	28	29	30		23	24	25	26	27	28	29
	..	..	..	..	..	..	..		30	31	..	..	..	..	..

STANDARD TIME.

The railroads of the United States and Canada use four standards of time in arranging time-tables, being local time of 75th, 90th, 105th and 120th degrees of longitude. Each belt (about 800 miles) is an area of 7½ degrees on each side of the meridian. The change to standard time went into effect October 11, 1883. Before this date there were 54 kinds of railroad time in the United States. The following are the working rules of standard time, each change being one hour, getting slower as we go West.

Eastern Time prevails over the whole section east of a line drawn from Buffalo, N.Y., through Pittsburgh, Pa ; Parkersburgh and Huntington, W. Va : Bristol, Tenn., and Augusta, Ga., changing at these places (except Grand Trunk, of Canada, which changes at Sarnia) to

Central Time, which extends to the irregular line drawn from Brandon, Man., through Mandan, Dak ; North Platte, Neb.; Dodge City, Kan., to El Paso, New Mexico. West of this line

Mountain Time is in use, and covers the district up to another line, which, starting from Heron, Mont., passes through Ogden, Utah, to Yuma, Ariz. From this line to the Pacific Ocean

Pacific Time is used.

Wherever the change has not been too great, it has been pretty generally adopted by the cities and towns in the respective belts.

JANUARY, 1888.

1st MONTH. **31 DAYS.**

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
1	**1**	S	7 25	4 44
2	**2**	M	7 25	4 44
3	**3**	Tu	7 25	4 45
4	**4**	W	7 25	4 46
5	**5**	Th	7 25	4 47
6	**6**	F	7 25	4 48
7	**7**	Sa	7 24	4 49
8	**8**	S	7 24	4 50
9	**9**	M	7 24	4 51
10	**10**	Tu	7 24	4 52
11	**11**	W	7 24	4 53
12	**12**	Th	7 23	4 54
13	**13**	F	7 23	4 55
14	**14**	Sa	7 22	4 56
15	**15**	S	7 22	4 57
16	**16**	M	7 22	4 59
17	**17**	Tu	7 21	5 00
18	**18**	W	7 21	5 01
19	**19**	Th	7 20	5 02
20	**20**	F	7 20	5 03
21	**21**	Sa	7 19	5 04
22	**22**	S	7 18	5 06
23	**23**	M	7 18	5 07
24	**24**	Tu	7 17	5 08
25	**25**	W	7 16	5 09
26	**26**	Th	7 15	5 10
27	**27**	F	7 15	5 12
28	**28**	Sa	7 14	5 13
29	**29**	S	7 13	5 14
30	**30**	M	7 12	5 15
31	**31**	Tu	7 11	5 17

Moon's Phases.

Last Q., Jan. 6, 6 h., 34 m., morn.
New M., Jan. 13, 3 h., 30 m., morn.
First Q., Jan. 20, 11 h., 41 m., eve.
Full M., Jan. 28, 6 h., 10 m., eve.

MEETINGS OF SOCIETIES.

1 NEW YEAR'S DAY.
2 Columbus A. P. C. New Haven C. C. Montreal A. P. C. New England P. A. St. Louis A. A. P. Grand Rapids P. C.
3 Photo. Sec. Am. Inst., N. Y. Photo. Soc., Chicago. Cleveland Camera Club; Annual. Plymouth County C. C.
4 Photo. Soc., Phila.; Annual.
5 Boston Camera Club; Annual. Pacific Coast A. P. A. P. S. Cincinnati.
6 Camera Club, Syracuse.
7 Providence A. P. A.
9 Pittsburgh A. P. S. Camera Club, Hartford.
10 Soc. A. P., New York. P. A., of Syracuse.
11 German Photo. Soc., New York.
12 Worcester Camera Club; Annual.
13 Camera Club, Syracuse.
16 Columbus A. P. C. Grand Rapids, P. C. Philadelphia A. P. C.
17 Cleveland Camera Club. Chicago L. S. C.
18 Photo. Soc., Philadelphia.
19 Boston Camera Club. Pacific Coast A. P. A., P. S. Cincinnati. St. Louis A. A. P.
20 Camera Club, Syracuse. Portland Camera Club. Baltimore A. P. S.
23 Pittsburgh A. P. S.
24 Soc. A. P., New York. Providence A. P. A.
25 German Photo. Soc., New York. New Orleans C. C.
27 Camera Club, Syracuse.

FEBRUARY, 1888.

2d MONTH. **29 DAYS.**

Day of Year.	Day of Month.	Day of Week.	N. Y. City.	
			Sun rises. H. M.	Sun sets. H. M.
32	**1**	W	7 10	5 18
33	**2**	Th	7 09	5 19
34	**3**	F	7 08	5 20
35	**4**	S	7 07	5 22
36	**5**	𝔖	7 06	5 23
37	**6**	M	7 05	5 24
38	**7**	Tu	7 04	5 25
39	**8**	W	7 03	5 26
40	**9**	Th	7 01	5 28
41	**10**	F	7 00	5 29
42	**11**	S	6 59	5 30
43	**12**	𝔖	6 58	5 31
44	**13**	M	6 56	5 32
45	**14**	Tu	6 55	5 34
46	**15**	W	6 54	5 35
47	**16**	Th	6 52	5 36
48	**17**	F	6 51	5 37
49	**18**	S	6 50	5 38
50	**19**	𝔖	6 48	5 40
51	**20**	M	6 47	5 41
52	**21**	Tu	6 46	5 42
53	**22**	W	6 44	5 43
54	**23**	Th	6 43	5 44
55	**24**	F	6 41	5 45
56	**25**	S	6 40	5 47
57	**26**	𝔖	6 38	5 48
58	**27**	M	6 36	5 49
59	**28**	Tu	6 35	5 50
60	**29**	W	6 35	5 50

Moon's Phases.

Last Q., Feb. 4, 2 h., 18 m., eve.
New M., Feb. 11, 6 h., 44 m., eve.
First Q., Feb. 19, 8 n., 51 m., eve.
Full M., Feb. 27, 6 h., 49 m., morn.

Meetings of Societies.

1 Photo. Soc., Philadelphia. Brooklyn A. P.; Annual.
2 Boston Camera Club. P. S. Cincinnati.
3 Camera Club, Syracuse.
4 Providence A. P. A.
6 Columbus A. P. C. New England P.A. New Haven C. C. Grand Rapids P. C. Montreal A. P. C. St. Louis A. A. P.
7 Photo. Sec. Am. Inst., New York. Photo. Soc., Chicago. Cleveland Camera Club. Plymouth County C. C.
8 German Photo. Soc., New York. Camera Club of Hartford; Annual.
9 Worcester Camera Club. Pacific Coast A. P. A.
10 Camera Club, Syracuse.
13 Pittsburgh A. P. S. Camera Club of Hartford.
14 Soc. A. P., New York. P. A. of Syracuse.
15 Photo. Soc., Philadelphia.
16 Boston Camera Club. P. S. Cincinnati.
17 Camera Club, Syracuse. Portland Camera Club. Baltimore A. P. S.
20 Columbus A. P. C. Grand Rapids P. C. Philadelphia A.P.C. St.Louis A.A.P.
21 Cleveland Camera Club. Chicago L. S. C. Providence A. P. A.
22 WASHINGTON'S BIRTHDAY. German Photo. Soc., New York. New Orleans C. C.
23 Pacific Coast A. P. A.
24 Camera Club, Syracuse.
27 Pittsburgh A. P. S.
28 Soc. A. P., New York.

MARCH, 1888.

3d MONTH. **31 DAYS.**

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
61	**1**	Th	6 34	5 51
62	**2**	F	6 32	5 52
63	**3**	Sa	6 31	5 54
64	**4**	S	6 29	5 55
65	**5**	M	6 28	5 56
66	**6**	Tu	6 26	5 57
67	**7**	W	6 24	5 58
68	**8**	Th	6 23	5 59
69	**9**	F	6 21	6 00
70	**10**	Sa	6 20	6 01
71	**11**	S	6 18	6 02
72	**12**	M	6 16	6 03
73	**13**	Tu	6 15	6 04
74	**14**	W	6 13	6 06
75	**15**	Th	6 11	6 07
76	**16**	F	6 10	6 08
77	**17**	Sa	6 08	6 09
78	**18**	S	6 06	6 10
79	**19**	M	6 05	6 11
80	**20**	Tu	6 03	6 12
81	**21**	W	6 01	6 13
82	**22**	Th	6 00	6 14
83	**23**	F	5 58	6 15
84	**24**	Sa	5 56	6 16
85	**25**	S	5 55	6 17
86	**26**	M	5 53	6 18
87	**27**	Tu	5 52	6 19
88	**28**	W	5 50	6 20
89	**29**	Th	5 48	6 21
90	**30**	F	5 47	6 22
91	**31**	Sa	5 45	6 24

Moon's Phases.

Last Q., Mch. 4, 10 h., 17 m., eve.
New M., Mch. 12, 11 h., 13 m., morn.
First Q., Mch. 20, 3 h., 35 m., eve.
Full M., Mch. 27, 4 h., 59 m., eve.

Meetings of Societies.

1 Boston Camera Club. P. S. Cincinnati; Annual.
2 Camera Club, Syracuse.
3 Providence A. P. A.
5 Columbus A. P. C. New England P. A. New Haven C. C. Grand Rapids P. C. Montreal A. P. C. St. Louis A. A. P.
6 Photo. Sec. Am. Inst., New York. Photo. Soc., Chicago. Cleveland Camera Club. Plymouth County C. C.
7 Photo. Soc., Philadelphia.
8 Worcester Camera Club. Pacific Coast A. P. A.; Annual.
9 Camera Club, Syracuse.
12 Pittsburgh A. P. S. Camera Club of Hartford.
13 Soc. A. P., New York. P. A. of Syracuse.
14 German Photo. Soc., New York.
15 Boston Camera Club. P. S. Cincinnati.
16 Camera Club, Syracuse. Portland Camera Club. Baltimore A. P. S.
19 Columbus A. P. C. Grand Rapids P. C. Philadelphia A. P. C. St. Louis A A. P.
20 Cleveland Camera Club. Providence A. P. A. Chicago L. S. C.
21 Photo. Soc., Philadelphia.
22 Pacific Coast A. P. A.
23 Camera Club, Syracuse.
26 Pittsburgh A. P. S.
27 Soc. A. P., New York.
28 German Photo. Soc., New York; Annual. New Orleans C. C.
30 Camera Club, Syracuse.

APRIL, 1888.

4th MONTH. **30 DAYS.**

Day of Year.	Day of Month.	Day of Week.	N. Y. City.			
			Sun rises.		Sun sets.	
			H.	M.	H.	M.
92	**1**	S	5	43	6	25
93	**2**	M	5	42	6	26
94	**3**	Tu	5	40	6	27
95	**4**	W	5	38	6	28
96	**5**	Th	5	37	6	29
97	**6**	F	5	35	6	30
98	**7**	Sa	5	33	6	31
99	**8**	S	5	32	6	32
100	**9**	M	5	30	6	33
101	**10**	Tu	5	29	6	34
102	**11**	W	5	27	6	35
103	**12**	Th	5	26	6	36
104	**13**	F	5	24	6	37
105	**14**	Sa	5	22	6	38
106	**15**	S	5	21	6	39
107	**16**	M	5	19	6	40
108	**17**	Tu	5	18	6	41
109	**18**	W	5	16	6	42
110	**19**	Th	5	15	6	43
111	**20**	F	5	13	6	44
112	**21**	Sa	5	12	6	45
113	**22**	S	5	10	6	46
114	**23**	M	5	09	6	47
115	**24**	Tu	5	08	6	48
116	**25**	W	5	06	6	50
117	**26**	Th	5	05	6	51
118	**27**	F	5	03	6	52
119	**28**	Sa	5	02	6	53
120	**29**	S	5	01	6	54
121	**30**	M	4	50	6	55

Moon's Phases.

Last Q., Apr. 3, 7 h., 33 m., morn.
New M., Apr. 11, 3 h., 59 m., morn.
First Q., Apr. 19, 6 h., 44 m., morn.
Full M., Apr. 26, 1 h., 14 m., morn.

Meetings of Societies.

2 Columbus A P.C. New England P.A. New Haven C. C. Grand Rapids P. C. Montreal A. P. C. St. Louis A. A. P.; Annual.

3 Photo. Sec. Am. Inst., New York. Photo. Soc., Chicago. Cleveland Camera Club. Plymouth County C. C.

4 Photo. Soc., Philadelphia.

5 Boston Camera Club. Pacific Coast A. P. A. P. S. Cincinnati.

6 Camera Club, Syracuse.

7 Providence A. P. A.

9 Pittsburgh A. P. S.; Annual. Camera Club of Hartford.

10 Soc. A. P., New York; Annual. P. A. of Syracuse.

11 German Photo. Soc., New York.

12 Worcester Camera Club.

13 Camera Club, Syracuse.

16 Columbus A. P.C. Grand Rapids P. C. Philadelphia A. P. C. St. Louis, A. A. P.

17 Cleveland Camera Club. Chicago L. S. C.

18 Photo. Soc., Philadelphia.

19 Boston Camera Club. Pacific Coast A. P. A. P. S. Cincinnati.

20 Camera Club, Syracuse. Portland Camera Club. Baltimore A. P. S.

23 Pittsburgh A. P. S.

24 Soc. A. P., New York. Providence A. P. A.

25 German Photo. Soc., New York. New Orleans C. C.

27 Camera Club, Syracuse.

MAY, 1888.

5th MONTH. **31 DAYS.**

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
122	**1**	Tu	4 58	6 56
123	**2**	W	4 57	6 57
124	**3**	Th	4 56	6 58
125	**4**	F	4 54	6 59
126	**5**	Sa	4 53	7 00
127	**6**	S	4 52	7 01
128	**7**	M	4 51	7 02
129	**8**	Tu	4 50	7 03
130	**9**	W	4 49	7 04
131	**10**	Th	4 48	7 05
132	**11**	F	4 47	7 06
133	**12**	Sa	4 46	7 07
134	**13**	S	4 45	7 08
135	**14**	M	4 44	7 09
136	**15**	Tu	4 43	7 10
137	**16**	W	4 42	7 11
138	**17**	Th	4 41	7 12
139	**18**	F	4 40	7 13
140	**19**	Sa	4 39	7 14
141	**20**	S	4 38	7 15
142	**21**	M	4 37	7 16
143	**22**	Tu	4 37	7 16
144	**23**	W	4 36	7 17
145	**24**	Th	4 35	7 18
146	**25**	F	4 35	7 19
147	**26**	Sa	4 34	7 20
148	**27**	S	4 33	7 21
149	**28**	M	4 33	7 21
150	**29**	Tu	4 32	7 22
151	**30**	W	4 32	7 23
152	**31**	Th	4 31	7 24

Meetings of Societies.

1 Photo. Sec. Am. Inst., N. Y. Photo. Soc., Chicago. Cleveland Cam. Club. Plymouth County C. C.

2 Photo. Soc., Philadelphia.

3 Boston Camera Club. P. S. Cincinnati.

4 Camera Club, Syracuse.

5 Providence A. P. A.

7 Columbus A. P. C. New England P. A. Hew Haven C.C. Grand Rapids P.C. Montreal A. P. C. St. Louis A. A. P.

8 Soc. A. P., New York. P. A. of Syracuse.

9 German Photo. Soc., New York.

10 Worcester Camera Club. Pacific Coast A. P. A.

11 Camera Club, Syracuse.

14 Pittsburgh A. P. S. Camera Club of Hartford.

15 Cleveland Camera Club.

16 Photo. Soc., Philadelphia.

17 Boston Camera Club. P. S. Cincinnati.

18 Camera Club, Syracuse. Portland Camera Club. Grand Rapids, P. C.; Annual. Baltimore A. P. S.

21 Columbus A. P. C. Grand Rapids P. C. Philadelphia A. P. C. St. Louis A. A. P.

22 Soc. A. P., New York. Chicago L. S. C. Providence A. P. A.

23 German Photo. Soc., New York. New Orleans, C. C.

24 Pacific Coast A. P. A.

25 Camera Club, Syracuse.

28 Pittsburgh A. P. S.

30 DECORATION DAY.

Moon's Phases.

Last Q., May 2, 6 h., 39 m., eve.
New M., May 10, 8 h., 15 m., eve.
First Q., May 18, 5 h., 57 m., eve.
Full M., May 25, 8 h., 22 m., morn.

JUNE, 1888.

6th MONTH. **30 DAYS.**

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
153	**1**	F	4 31	7 25
154	**2**	Sa	4 30	7 25
155	**3**	S	4 30	7 26
156	**4**	M	4 30	7 27
157	**5**	Tu	4 29	7 27
158	**6**	W	4 29	7 28
159	**7**	Th	4 29	7 29
160	**8**	F	4 29	7 29
161	**9**	Sa	4 28	7 30
162	**10**	S	4 28	7 30
163	**11**	M	4 28	7 31
164	**12**	Tu	4 28	7 31
165	**13**	W	4 28	7 32
166	**14**	Th	4 28	7 32
167	**15**	F	4 28	7 33
168	**16**	Sa	4 28	7 33
169	**17**	S	4 28	7 33
170	**18**	M	4 28	7 34
171	**19**	Tu	4 28	7 34
172	**20**	W	4 28	7 34
173	**21**	Th	4 29	7 34
174	**22**	F	4 29	7 35
175	**23**	Sa	4 29	7 35
176	**24**	S	4 30	7 35
177	**25**	M	4 30	7 35
178	**26**	Tu	4 30	7 35
179	**27**	W	4 31	7 35
180	**28**	Th	4 31	7 35
181	**29**	F	4 31	7 35
182	**30**	Sa	4 32	7 35

Moon's Phases.

Last Q., June 1, 7 h., 45 m., morn.
New M., June 9, 7 h., 26 m., morn.
First Q., June 17, 1 h., 41 m., morn.
Full M., June 23, 3 h., 59 m., eve.
Last Q., June 30, 10 h., 44 m., eve.

MEETINGS OF SOCIETIES.

1 Camera Club, Syracuse.

2 Providence A. P. A.

4 Columbus A. P. C. New England P. A. New Haven C.C. Grand Rapids P.C. Montreal A. P. C. St. Louis A. A. P.

5 Photo. Soc. Am. Inst., N. Y. Photo. Soc., Chicago. Cleveland Cam. Club. Plymouth County C. C. ; Annual.

6 Photo. Soc., Philadelphia.

7 Boston Camera Club. Pacific Coast A. P. A. P. S. Cincinnati.

8 Camera Club, Syracuse.

11 Pittsburgh A. P. S. Camera Club of Hartford.

12 Soc. A. P., New York. P. A. of Syracuse.

13 German Photo. Soc., New York.

14 Worcester Camera Club.

15 Camera Club, Syracuse. Portland Camera Club. Baltimore A. P. S.

18 Columbus A. P. C. Grand Rapids P. C. Philadelphia A.P.C. St. Louis A.A.P.

19 Cleveland Camera Club. Chicago L.S.C. Providence A. P. A.

20 Photo. Soc., Philadelphia.

21 Boston Camera Club. Pacific Coast A. P. A. P. S. Cincinnati.

22 Camera Club, Syracuse.

25 Pittsburgh A. P. S..

26 Soc. A. P., New York.

27 German Photo. Soc., New York. New Orleans C. C.

29 Camera Club, Syracuse.

JULY, 1888.

7th MONTH. **31 DAYS.**

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
183	**1**	S	4 32	7 35
184	**2**	M	4 33	7 35
185	**3**	Tu	4 33	7 35
186	**4**	W	4 34	7 34
187	**5**	Th	4 35	7 34
188	**6**	F	4 35	7 34
189	**7**	Sa	4 36	7 33
190	**8**	S	4 37	7 33
191	**9**	M	4 37	7 33
192	**10**	Tu	4 38	7 32
193	**11**	W	4 39	7 32
194	**12**	Th	4 39	7 31
195	**13**	F	4 40	7 31
196	**14**	Sa	4 41	7 30
197	**15**	S	4 42	7 30
198	**16**	M	4 42	7 29
199	**17**	Tu	4 43	7 29
200	**18**	W	4 44	7 28
201	**19**	Th	4 45	7 27
202	**20**	F	4 46	7 27
203	**21**	Sa	4 47	7 26
204	**22**	S	4 47	7 25
205	**23**	M	4 48	7 24
206	**24**	Tu	4 49	7 23
207	**25**	W	4 50	7 22
208	**26**	Th	4 51	7 21
209	**27**	F	4 52	7 20
210	**28**	Sa	4 53	7 19
211	**29**	S	4 53	7 18
212	**39**	M	4 54	7 17
213	**31**	Tu	4 55	7 16

Moon's Phases.

New M., July 9, 1 h., 8 m., morn.
First Q., July 16, 7 h., 4 m., morn.
Full M., July 23, 0 h., 37 m., morn.
Last Q., July 30, 3 h., 21 m., eve.

Meetings of Societies.

2 New England P. A. New Haven C. C. Grand Rapids P.C. Montreal A.P.C. St. Louis A. A. P.

3 Photo. Soc., Chicago. Cleveland Camera Club. Plymouth County C. C.

4 INDEPENDENCE DAY. Photo. Soc., Phila.

5 Pacific Coast A. P. A. P. S. Cincinnati.

6 Camera Club, Syracuse.

7 Providence A. P. A.

9 Pittsburgh A. P. S. Camera Club of Hartford.

10 P. A. of Syracuse.

11 German Photo. Soc., New York.

12 Worcester Camera Club.

13 Camera Club, Syracuse.

16 Grand Rapids P.C. Philadelphia A.P.C. St. Louis A. A. P.

17 Cleveland Camera Club. Chicago L.S.C.

18 Photo. Soc., Philadelphia.

19 Pacific Coast A. P. A. P.S.Cincinnati.

20 Camera Club, Syracuse. Portland Camera Club. Baltimore A. P. S.

23 Pittsburgh A. P. S.

24 Providence A. P. A.

25 German Photo. Soc., New York. New Orleans C. C.

27 Camera Club, Syracuse.

AUGUST, 1888.

8th MONTH. **31 DAYS.**

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
214	**1**	W	4 56	7 15
215	**2**	Th	4 57	7 14
216	**3**	F	4 58	7 13
217	**4**	Sa	4 59	7 12
218	**5**	S	5 00	7 11
219	**6**	M	5 01	7 10
220	**7**	Tu	5 02	7 09
221	**8**	W	5 03	7 07
222	**9**	Th	5 04	7 06
223	**10**	F	5 05	7 05
224	**11**	Sa	5 06	7 04
225	**12**	S	5 07	7 02
226	**13**	M	5 08	7 01
227	**14**	Tu	5 09	7 00
228	**15**	W	5 10	6 58
229	**16**	Th	5 11	6 57
230	**17**	F	5 12	6 55
231	**18**	Sa	5 13	6 54
232	**19**	S	5 14	6 53
233	**20**	M	5 15	6 51
234	**21**	Tu	5 16	6 50
235	**22**	W	5 17	6 48
236	**23**	Th	5 18	6 47
237	**24**	F	5 19	6 45
238	**25**	Sa	5 20	6 44
239	**26**	S	5 21	6 42
240	**27**	M	5 22	6 41
241	**28**	Tu	5 23	6 39
242	**29**	W	5 24	6 37
243	**30**	Th	5 25	6 36
244	**31**	F	5 26	6 34

Moon's Phases.

New M., Aug. 7, 1 h., 12 m., eve.
First Q., Aug. 14, 11 h., 36 m., morn.
Full M., Aug. 21, 11 h., 12 m., morn.
Last Q., Aug. 29, 9 h., 9 m., morn.

Meetings of Societies.

1 Photo. Soc., Philadelphia.
2 P. S. Cincinnati.
3 Camera Club, Syracuse.
4 Providence A. P. A.
6 New England P. A. New Haven C.C. Grand Rapids P.C. Montreal A.P.C. St. Louis A. A. P.
7 Photo. Soc., Chicago. Cleveland Camera Club. Plymouth County C. C.
8 German Photo. Soc., New York.
9 Worcester Camera Club. Pacific Coast A. P. A.
10 Camera Club, Syracuse.
13 Pittsburgh A. P. S. Camera Club of Hartford.
14 P. A. of Syracuse.
15 Photo. Soc., Philadelphia.
16 P. S. Cincinnati.
17 Camera Club, Syracuse. Portland Camera Club. Baltimore A. P. S.
20 Grand Rapids P. C. St. Louis A. A. P. Philadelphia A. P. C.
21 Cleveland Camera Club. Pacific Coast A. P. A. Chicago L. S. C. Providence A. P. A.
22 German Photo. Soc., New York. New Orleans C. C.
24 Camera Club, Syracuse.
27 Pittsburgh A. P. S.
31 Camera Club, Syracuse.

SEPTEMBER, 1888.

9th MONTH. **30 DAYS.**

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
245	**1**	Sa	5 27	6 33
246	**2**	S	5 28	6 31
247	**3**	M	5 29	6 29
248	**4**	Tu	5 30	6 28
249	**5**	W	5 31	6 26
250	**6**	Th	5 32	6 24
251	**7**	F	5 33	6 23
252	**8**	Sa	5 34	6 21
253	**9**	S	5 35	6 19
254	**10**	M	5 36	6 18
255	**11**	Tu	5 37	6 16
256	**12**	W	5 38	6 15
257	**13**	Th	5 39	6 13
258	**14**	F	5 40	6 11
259	**15**	Sa	5 41	6 09
260	**16**	S	5 42	6 08
261	**17**	M	5 43	6 06
262	**18**	Tu	5 44	6 04
263	**19**	W	5 45	6 03
264	**20**	Th	5 46	6 01
265	**21**	F	5 47	5 59
266	**22**	Sa	5 48	5 58
267	**23**	S	5 49	5 56
268	**24**	M	5 50	5 54
269	**25**	Tu	5 51	5 53
270	**26**	W	5 52	5 51
271	**27**	Th	5 53	5 49
272	**28**	F	5 54	5 48
273	**29**	Sa	5 55	5 46
274	**30**	S	5 56	5 44

Moon's Phases.

New M., Sep. 5, 11 h., 48 m., eve.
First Q., Sep. 12, 4 h., 51 m., eve.
Full M., Sep. 20, 0 h., 16 m., morn.
Last Q., Sep. 28, 3 h., 22 m., morn.

Meetings of Societies.

1 Providence A. P. A.

3 Columbus A. P.C. New England P. A. New Haven C. C. Grand Rapids P. C. Montreal A. P. C. St. Louis A. A. P.

4 Photo. Sec. Am. Inst., N. Y. Photo. Soc., Chicago. Cleveland Cam. Club. Plymouth County C. C.

5 Photo. Soc., Philadelphia.

6 Pacific Coast A. P. A. P. S. Cincinnati.

7 Camera Club, Syracuse.

10 Pittsburgh A. P. S. Camera Club of Hartford.

11 Soc. A. P., New York. P. A. of Syracuse.

12 German Photo. Soc., New York.

13 Worcester Camera Club.

14 Camera Club, Syracuse.

17 Columbus A. P. C. Grand Rapids, P. C. Philadelphia A. P. C. St. Louis A. A. P.

18 Cleveland Camera Club. Chicago L.S.C. Providence A. P. A.

19 Photo. Soc., Philadelphia.

20 Pacific Coast A. P. A. P. S. Cincinnati.

21 Camera Club, Syracuse. Portland Camera Club. Baltimore A. P. S.

24 Pittsburgh A. P. S.

25 Soc. A. P., New York.

26 German Photo. Soc., New York. New Orleans C. C.

28 Camera Club, Syracuse.

OCTOBER, 1888.

10th MONTH. **31 DAYS.**

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
275	**1**	M	5 57	5 43
276	**2**	Tu	5 58	5 41
277	**3**	W	5 59	5 39
278	**4**	Th	6 00	5 38
279	**5**	F	6 01	5 36
280	**6**	Sa	6 02	5 34
281	**7**	S	6 03	5 33
282	**8**	M	6 04	5 31
283	**9**	Tu	6 05	5 30
284	**10**	W	6 06	5 28
285	**11**	Th	6 07	5 26
286	**12**	F	6 08	5 25
287	**13**	Sa	6 09	5 23
288	**14**	S	6 10	5 22
289	**15**	M	6 12	5 20
290	**16**	Tu	6 13	5 19
291	**17**	W	6 14	5 17
292	**18**	Th	6 15	5 16
293	**19**	F	6 16	5 14
294	**20**	Sa	6 17	5 13
295	**21**	S	6 18	5 11
296	**22**	M	6 19	5 10
297	**23**	Tu	6 20	5 08
298	**24**	W	6 22	5 07
299	**25**	Th	6 23	5 06
300	**26**	F	6 24	5 04
301	**27**	Sa	6 25	5 03
302	**28**	S	6 26	5 02
303	**29**	M	6 27	5 01
304	**30**	Tu	6 28	4 59
305	**31**	W	6 29	4 58

Moon's Phases.

New M., Oct. 5, 10 h., 26 m., morn.
First Q., Oct. 12, 3 h., 21 m., morn.
Full M., Oct. 19, 4 h., 01 m., eve.
Last Q., Oct. 27, 8 h., 47 m., eve.

MEETINGS OF SOCIETIES.

1 Columbus A. P. C.; Annual. Montreal A. P. C. New Haven C. C. St. Louis A. A. P. New England P. A. Grand Rapids P. C.

2 Photo. Sec. Am. Inst., N. Y. Photo. Soc., Chicago. Cleveland Cam. Club. Plymouth County C. C.

3 Photo. Soc., Philadelphia.

4 Boston Camera Club. Pacific Coast A. P. A. P. S. Cincinnati.

5 Camera Club, Syracuse.

6 Providence A. P. A,

8 Pittsburgh A. P. S. Camera Club of Hartford.

9 Soc. A. P., New York. P. A. of Syracuse.

10 German Photo. Soc., New York.

11 Worcester Camera Club.

12 Camera Club, Syracuse.

15 Columbus A. P. C. Grand Rapids P. C. Philadelphia A. P. C. St. Louis A. A. P.

16 Cleveland Camera Club. Chicago L.S.C.

17 Photo. Soc., Philadelphia.

18 Boston Camera Club. Pacific Coast A. P. A. P. S. Cincinnati.

19 Camera Club, Syracuse. Portland Camera Club. Baltimore A. P. S.

22 Pittsburgh A. P. S.

23 Soc. A. P., New York. Providence A. P. A.

24 German Photo. Soc., New York. New Orleans C. C.

26 Camera Club, Syracuse.

NOVEMBER, 1888.

11th MONTH. **30 DAYS.**

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H.	M.	Sun sets. H.	M.
306	**1**	Th	6	30	4	57
307	**2**	F	6	31	4	56
308	**3**	Sa	6	33	4	55
309	**4**	S	6	34	4	54
310	**5**	M	6	35	4	52
311	**6**	Tu	6	37	4	51
312	**7**	W	6	38	4	50
313	**8**	Th	6	39	4	49
314	**9**	F	6	40	4	48
315	**10**	Sa	6	41	4	47
316	**11**	S	6	43	4	46
317	**12**	M	6	44	4	45
318	**13**	Tu	6	45	4	44
319	**14**	W	6	46	4	43
320	**15**	Th	6	47	4	42
321	**16**	F	6	49	4	42
322	**17**	Sa	6	50	4	41
323	**18**	S	6	51	4	40
324	**19**	M	6	52	4	39
325	**20**	Tu	6	53	4	39
326	**21**	W	6	54	4	38
327	**22**	Th	6	56	4	37
328	**23**	F	6	57	4	37
329	**24**	Sa	6	58	4	36
330	**25**	S	6	59	4	36
331	**26**	M	7	00	4	35
332	**27**	Tu	7	01	4	35
333	**28**	W	7	02	4	34
334	**29**	Th	7	03	4	34
335	**30**	F	7	04	4	34

Moon's Phases.

New M., Nov. 3, 6 h., 54 m., eve.
First Q., Nov. 9, 11 h., 7 m., morn.
Full M., Nov. 18, 10 h., 7 m., morn.
Last Q., Nov. 27, 0 h., 12 m., eve.

Meetings of Societies.

1 Boston Camera Club. P. S. Cincinnati,
2 Camera Club, Syracuse.
3 Providence A. P. A.
5 Columbus A. P. C. New England P. A. New Haven C. C. Grand Rapids P. C. Montreal A. P. C. St. Louis A. A. P.
6 Photo. Sec. Am. Inst., N. Y. Photo. Soc., Chicago. Cleveland Cam. Club. Plymouth County C. C.
7 Photo. Soc., Philadelphia.
8 Worcester Camera Club. Pacific Coast A. P. A.
9 Camera Club, Syracuse.
12 Pittsburgh A. P. S. Camera Club of Hartford.
13 Soc. A. P., New York. P. A. of Syracuse.
14 German Photo. Soc., New York.
15 Boston Camera Club. P. S. Cincinnati.
16 Camera Club, Syracuse. Portland Camera Club. Baltimore A. P. S.
19 Columbus A. P. C. Grand Rapids P. C. Philadelphia A. P. C. St. Louis A. A. P.
20 Cleveland Camera Club. Providence A. P. A. Chicago L. S. C.
21 Photo. Soc., Philadelphia.
22 Pacific Coast A. P. A.
23 Camera Club, Syracuse.
26 Pittsburgh A. P. S.
27 Soc. A. P., New York.
28 German Photo. Soc., New York. New Orleans C. C.
29 THANKSGIVING DAY.
30 Camera Club, Syracuse.

DECEMBER, 1888.

12th MONTH. **31 DAYS.**

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
336	**1**	Sa	7 05	4 34
337	**2**	S	7 06	4 33
338	**3**	M	7 07	4 33
339	**4**	Tu	7 08	4 33
340	**5**	W	7 09	4 33
341	**6**	Th	7 10	4 33
342	**7**	F	7 11	4 33
343	**8**	Sa	7 12	4 33
344	**9**	S	7 13	4 33
345	**10**	M	7 14	4 33
346	**11**	Tu	7 14	4 33
347	**12**	W	7 15	4 33
348	**13**	Th	7 16	4 33
349	**14**	F	7 17	4 34
350	**15**	Sa	7 17	4 34
351	**16**	S	7 18	4 34
352	**17**	M	7 19	4 34
353	**18**	Tu	7 19	4 35
354	**19**	W	7 20	4 35
355	**20**	Th	7 21	4 36
356	**21**	F	7 21	4 36
357	**22**	Sa	7 22	4 36
358	**23**	S	7 22	4 37
359	**24**	M	7 22	4 38
360	**25**	Tu	7 23	4 38
361	**26**	W	7 23	4 39
362	**27**	Th	7 24	4 40
363	**28**	F	7 24	4 40
364	**29**	Sa	7 24	4 41
365	**30**	S	7 24	4 42
366	**31**	M	7 24	4 43

Moon's Phases.

New M., Dec. 3, 4 h., 57 m., morn.
First Q., Dec. 10, 1 h., 37 m., morn.
Full M., Dec. 18, 5 h., 32 m., morn.
Last Q., Dec. 26, 0 h., 51 m., morn.

MEETINGS OF SOCIETIES.

1 Montreal A. P. C.; Annual. Providence A. P. A.

3 Columbus A. P. C. New Haven C. C. Grand Rapids P. C. Montreal A.P.C. St. Louis A. A. P. New England P.A.

4 Photo. Sec. Am. Inst., N. Y. Photo. Soc., Chicago. Cleveland Cam. Club. Plymouth County C. C.

5 Photo. Soc., Philadelphia.

6 Boston Camera Club. Pacific Coast A. P. A. P. S. Cincinnati.

7 Camera Club, Syracuse.

10 Pittsburgh A. P. S. Camera Club of Hartford.

11 Soc. A. P., New York. P. A. of Syracuse.

12 German Photo. Soc., New York.

13 Worcester Camera Club.

14 Camera Club, Syracuse.

17 Columbus A. P. C. Grand Rapids P.C. Philadelphia A. P. C. St. Louis A. A. P.

18 Cleveland Camera Club. Providence A. P. A. Chicago L. S. C.

19 Photo. Soc., Philadalphia.

20 Boston Camera Club. Pacific Coast A. P. A. P. S. Cincinnati.

21 Camera Club, Syracuse. Portland Camera Club. Baltimore A. P. S.

24 Pittsburgh A. P. S.

25 CHRISTMAS DAY. Soc. A. P., New York.

26 German Photo. Soc., New York. New Orleans C. C.

28 Camera Club, Syracuse.

AMERICAN PHOTOGRAPHIC SOCIETIES.

Photographical Section of the American Institute.

New York City. Organized Mar. 26, 1859.

President—Henry J. Newton. *Vice-President*—John B. Gardner.
Executive Committee—J. B. Gardner, Chairman.
Treasurer—Edward Schell. *Librarian*—John W. Chambers.
Secretary—Oscar G. Mason, Photographical Department, Bellevue Hospital, New York City.

Place of Meeting, Institute Hall, Clinton Buildings. Ordinary Meetings at 8 o'clock P. M. on the first Tuesday of each month, except July and August. Special Meetings, upon call of officers. Annual Meeting, first Thursday in February. Membership, September 1: All members of the American Institute; total, about 2,100. Exhibitions annual, September, October, and November.

The Photographic Society of Philadelphia.

Philadelphia. Organized Nov. 26, 1862.

President—Frederic Graff.
Vice-Presidents—John G. Bullock, Joseph H. Burroughs.
Executive Committee—Galloway C. Morris, John G. Bullock, Joseph H. Burroughs.
Treasurer—S. Fisher Corlies.
Secretary—Robert S. Redfield, 1601 Callowhill St., Philadelphia, Pa.

Place of Meeting, Society's Rooms, 31 South 15th St. Ordinary Meetings, first Wednesday of each month, 8 P. M. Conversational Meetings, third Wednesday of each month, 8 P. M. Annual Meeting, first Wednesday in January, 8 P. M. Membership, September 1: Life and active, 149. Exhibitions annual, in connection with Society of Amateur Photographers of New York, and Boston Camera Club.

German Photographic Society of New York.

New York City. Organized, 1868.

President—A. Mildenberger. *Vice-President*—O. Buehler.
Trustees—A. Baumgarten, L. Nagel, Ch. Kutscher.
Treasurer—G. E. Pellnitz. *Librarian*—L. Burkhardt.
Secretaries—A. Esselborn, 877 Forest Ave., N. Y.; G. Weinig, 323 E. 117th St., N. Y.

Place of Meeting, 62 E. 4th St., N. Y. Ordinary Meetings, every second and fourth Wednesday of each month. Quarterly Meetings, fourth Wednesday in March, June, September and December. Annual Meeting, fourth Wednesday in March. Membership, September 1: Honorary, 6; active, 24; total, 30.

Photographers' Association of America.

Organized 1879.

President—E. Decker, Cleveland, O.
Vice-Presidents—C. W. Motes, Atlanta, Ga.; F. W. Guerin, St. Louis, Mo.
Treasurer—G. M. Carlisle, Providence. R. I.
Secretary—W. H. Potter, Indianapolis, Ind.

Ninth annual convention appointed to meet at Minneapolis second week in August, 1888.

Boston Camera Club.

Established, 1882, as Boston Soc'y of Am. Photographers. Reorganized as Boston Camera Club. Incorporated April 6, 1887.

President—Geo. E. Cabot, Brookline. *Vice-President*—Francis Blake.

Executive Committee—Geo. E. Cabot, Francis Blake, E. F. Wilder, Wm. Garrison Reed, J. G. Hubbard, A. L. Plimpton, Henry N. Sweet, Chas. E. Davis, Jr., F. Alcott Pratt, John L. Curtis.

Treasurer—Wm. Garrison Reed. *Librarian*—Edw. F. Wilder.

Secretary, pro tem.—E. F. Wilder, 47 Tremont St., Boston.

Place of Meeting, 50 Bromfield St., Club Rooms. Regular Meetings, first Thursdays except July, August, and September. Special Meetings, third Thursdays except July, August and September. Annual Meeting, first Thursday in January. Exhibitions triennial in conjunction with the New York and Philadelphia societies. Club exhibitions informal at irregular intervals at the rooms. Competitive Field Day in the Spring of each year.

Pacific Coast Amateur Photographic Association.

San Francisco. Organized Feb. 19, 1883.

President—Geo. Tasheira. *Vice-President*—A. J. Treat.

Executive Committee—Messrs. Clinton Day, W. S. Davis, J. L. Cherry.

Treasurer, Librarian, and Secretary—H. S. Herrick, Room 22, 325 Montgomery St., San Francisco, California.

Place of Meeting, 605 Merchant St. Ordinary Meetings, first Thursday after the first Monday in each month, 8 P. M. Informal Meetings, second Thursday after each regular meeting, 4 to 6 P. M. Annual Meeting, first Thursday after first Monday in March, 8 P. M. Membership, September 1: Honorary, 3; active, 47; corresponding, 6; total, 56. Publications, *Pacific Coast Amateur Photographer.* Annual Exhibition, December.

Photographic Section of Cincinnati Society of Natural History.

Cincinnati. Organized December, 1883, as Camera Club of Cincinnati.

President—Dwight W. Huntington. *Vice-President*—E. B. Johnston.

Executive Committee—Officers, *ex officio.*

Treasurer—T. H. Kelley. *Librarian*—Arch. I. Carson.

Secretary—C. L. Harrison, First National Bank, Cincinnati, O.

Place of meeting, 108 Broadway. Ordinary Meetings, first and third Thursdays in the month, at 8 P. M. in Fall and Winter and 4 P. M. in late Spring and Summer. Annual meeting, first Thursday in March. Membership, September 1: Honorary, 1; active, 64; total, 65. Exhibitions, Lantern slide interchange once a month; three special ones open to the public through members, and others as occasion demands.

Photographic Association of Canada.

Toronto. Organized, Jan. 24, 1884.

President—E. Stanton, Toronto. *Vice-President*—S. J. Dixon, Toronto.

Executive Committee—A. T. Barraud, Barrie; J. Stephens, Barrie; J. F. Bryce, Toronto.

Secretary and Treasurer—E. Poole, St. Catharines.

Annual Meeting at Toronto in August. Membership, September 1: Active, about 125. Exhibitions at annual meeting.

Philadelphia Amateur Photographic Club.

Philadelphia. Organized Dec. 21, 1883, Incorporated Feb. 12, 1887.

President—William A. Haines.
Vice-Presidents—H. P. Gillingham and Philip P. Chase.
Directors—Wm. A. Haines, H. P. Gillingham, Philip P. Chase, Alfred Thompson, F. G. Stuart, Wm. Super, Jr., Alfred Clements, Esmonde Harper, F. A. Cunningham, Horace G. Philips, Howard Pusey, Edwin Bromfield.
Treasurer—F. G. Stuart.
Secretary—Alfred Thompson, 1311 Butler St., Nicetown, Philadelphia, Pa.

Place of Meeting, 907 Filbert St., Philadelphia. Ordinary meetings, third Monday of each month, excepting July and August, at 8 o'clock P. M. Annual Meeting, February 12. Membership, September 1: Active, 32.

The Society of Amateur Photographers of New York.

New York. Organized March 28, 1884, Incorporated June 9, 1885.

President—Dexter H. Walker. *Vice-President*—George R. Allerton.
Board of Directors—Dexter H. Walker, Geo. R. Allerton, Sydney Bishop, Thos. T. Eckert, Jr., Robt. M. Fuller, W. M. Frisbie, John T. Granger, C. C. Roumage, Jr., Richard H. Lawrence, Henry V. Parsell, Daniel P. Read.
Treasurer—Henry V. Parsell. *Librarian*—C. C. Roumage, Jr.
Corresponding Secretary—John T. Granger, 1 Broadway, New York.
Recording Secretary—Daniel P. Read.

Place of Meeting, Society Rooms, 122 W. 36th St. Ordinary Meetings, second Tuesday of each month, except July and August, at 8 P. M. Special Meetings, fourth Wednesday evenings, except July and August, and on call of President. Annual Meeting, second Tuesday in April. Membership, September 1: Honorary, 5; active, 134; subscribing, 12; corresponding, 31; associate, 32; total, 214. Publications, Proceedings. Lantern exhibitions, monthly; annual exhibition in connection with Boston and Philadelphia Societies.

Columbus Amateur Photographic Club,

Columbus, Ohio. Organized, Oct. 13. 1884.

President—Prof. Albert H. Tuttle.
Executive Committee—Prof. Albert H. Tuttle, Prof. Walter S. Goodnough, Prof. E. H. Mark.
Treasurer, Librarian and Secretary—Prof. Walter S. Goodnough.

Place of Meeting, Columbus Art School, 15 E. Long St. Ordinary Meetings, third Monday evenings of each month, except July and August, at 8 o'clock P. M. Annual Meeting, first Monday in October. Membership, September 1: Active, 15; corresponding, 7; total, 22. Exhibitions usually at same time as Art School, the second week of June.

Photographers' Association of Syracuse.

Syracuse. Established November 12, 1884.

President—Philip S. Ryder. *Vice-President*—Ward V. Ranger.
Treasurer—Robert A. Goodwin. *Secretary*—I. W. Dorest.

Meetings are held the second Tuesday of each month.

The Pyro Club.

Norwich, Conn. Organized Nov. 10, 1884.

President—M. A. Barber. *Vice-President*—C. B. Chapman.
Treasurer—W. C. Weldon. *Librarian*—Tyler J. Howard.
Secretary—W. Hamilton Burnett, 161 Main St., Norwich, Conn.

Place of Meeting, 161 Main St. Ordinary Meetings, every two weeks at 7:30. Special Meetings, at the call of the President. Annual Meeting, first Monday in October. Membership, September 1: Honorary, 1; active, 19.

Camera Club of Hartford, Conn.

Hartford. Organized Feb. 18, 1885.

President—W. J. Hickmott.
Executive Committee—W. J. Hickmott, Elmer M. White, A. H. Pitkin, H. O. Warner, Henry F. Smith.
Treasurer—Elmer M. White. *Librarian*—J. Coolidge Hills.
Secretary—Elmer M. White, P. O. Box 708, Hartford, Conn.

Place of Meeting, 410 Main St., Room 13. Ordinary Meetings, second Monday of each month except July and August, 7:30 P. M. Annual Meeting, second Wednesday in February. Membership, September 1: Active, 24. Annual exhibition, November or December. Field days, Decoration Day and some day in the Fall or early Winter.

Baltimore Amateur Photographic Society.

Baltimore. Organized April 29, 1885.

President—Isaac T. Norris. *Vice-President*—Daniel Miller.
Executive Committee—D. Miller, chairman; J. S. Cummins, W. F. Jones, J. V. Wagner, Edw. Huber.
House Committee—Henry Lauts, chairman; J. H. Trimble, I. T. Norris, W. B. King.
Treasurer—J. H. Trimble.
Secretary—James S. Cummins, 5 N. Charles St., Baltimore, Md.

Place of Meeting, 5 North Charles St. Ordinary Meetings, every third Friday in the month. Membership, September 1: Honorary, 5; active, 42; corresponding, 2; total, 49. Exhibitions: Annual public lantern slide exhibition in May.

Pittsburg Amateur Photographers' Society.

Pittsburg. Organized June 8, 1885.

President.—A. S. Murray. *Vice-President*—G. S. Orth.
Executive Committee—G. S. Orth, N. G. von Bonnhorst, L. S. Clarke, H. R. Moorhead, W. L. Scaife.
Treasurer—Gilbert A. Hays. *Librarian*—J. H. Hunter.
Secretary—F. R. C. Perrin, Crafton, Allegheny Co., Pa.

Place of Meeting, 59 Fourth Ave. Ordinary Meetings, second Monday in each month, 7:30 P. M. Lantern Meetings, fourth Monday in each month, 8 P. M. Annual Meeting, first week in April. Membership, September 1: Honorary, 3; active 116; non-resident, 1; total, 120.

St. Louis Association of Amateur Photographers.

St. Louis. Organized Oct. 13, 1885.

President—R. E. M. Bain. *Vice-President*—Rev. C. M. Charroppin, S. J.
Executive Committee—R. E. M. Bain, Rev. C. M. Charroppin (*ex officio*), J. C. Achterman, J. W. Dunn, W. H. Wilcox.
Treasurer—W. M. Butler. *Librarian*—Gray Staunton.
Secretary—W. M. Butler, 2636 Osage St., St. Louis, Mo.

Place of Meeting, St. Louis University. Ordinary Meetings, first Monday each month. Special Meetings, third Monday each month. Annual Meeting, first Monday in April. Membership, September 1: Honorary, 18; active, 34; total, 52. Exhibitions, public every two months; private, third Monday each month.

Worcester Camera Club.

Worcester, Mass. Organized Oct. 16, 1885.

President—George E. Francis, M. D.
Executive Committee—G. E. Francis, J. C. Lyford, H. E. Clarke.
Treasurer—Harriet E. Clarke.
Secretary—J. Chauncy Lyford, Worcester, Mass.

Place of Meeting, Natural History Rooms. Ordinary Meetings, second Thursday of each month, 7:30 P. M. Annual Meeting, second Thursday in January. Membership, September 1: Active, 40. Second annual exhibition about Feb. 17, 1888.

Photographic Society of Chicago.

Chicago, Ill. Organized, 1885.

President—Prof. G. W. Hough.
Vice-Presidents—Judge Bradwell, F. F. Charles.
Executive Committee—L. W. Felt, R. P. Harley, Dr. H. D. Garrison.
Treasurer—H. L. Tolman.
Secretary—C. Gentilé, 298 Dearborn St., Chicago.

Place of Meeting, Art Institute. Ordinary Meetings, first Tuesday in the month at 8 P. M. Membership, September 1: Active, 50.

Plymouth County Camera Club.

Massachusetts. Organized June 14, 1886.

President—C. E. Foye, Whitman, Mass.
Executive Committee—F. L. Erskine, C. R. Ransden, A. A. Holmes.
Treasurer and Secretary—C. H. Holmes.

Place of Meeting, Brockton and East Bridgewater. Ordinary Meetings, first Tuesday evening in each month, Annual Meeting, first Tuesday in June. Membership, September 1: Honorary, 12; active, 9; total, 21.

The Camera Club.

Portland, Oregon. Organized August 20, 1886.

President—Frank Woolsey.
Treasurer and Secretary—F. Woodward.
Corresponding Secretary—W. W. Bretherton, Portland, Oregon.

Ordinary Meetings, third Friday each month at 8 P. M. Membership, September 1: Honorary, 8; active, 24; total, 32.

Springfield Camera Club.
Springfield, Mass. Organized Oct. 11, 1886.
President—L. J. Powers, Jr.
Executive Committee—L. J. Powers, Jr., G. M. Barney, F. A. Nickerson, John D. White, N. P. A. Carter.
Treasurer and Secretary—G. M. Barney, Springfield, Mass.

Place of Meeting, residence of members. Ordinary meetings, monthly at call of executive committee. Annual Meeting, October. Membership, September 1 : Honorary, 1 ; active, 23 ; total, 24.

Montreal Amateur Photographic Club.
Montreal. Organized November 5, 1886.
President—James G. Shaw. *Vice-President*—John S. Hall, Jr.
Committee of Management—T. H. Lightbound, A. B. Gwilt, G. Y. Bishop, R. M. Hannaford.
Treasurer—F. G. Gnaedinger.
Secretary—J. W. Davis, 12 McGill College Ave., Montreal.

Place of Meeting, 12 McGill College Ave. Ordinary Meetings, first Monday each month. Annual Meeting, first Saturday in December. Membership, September 1: Active, 32.

Camera Club of Syracuse.
Syracuse, N. Y. Organized December, 1886.
President—Dr. Ely Van de Warker. *Vice-President*—Dr. Brown.
Executive Committee—Officers *ex officio*. *Treasurer*—Fred. Frazer.
Secretary—Charles R. Sherlock, Syracuse, N. Y.

Place of Meeting, Club Rooms, Greyhound Building. Ordinary Meetings, Friday evenings. Membership, September 1 : Active, 52. Exhibitions, yearly (no date fixed).

Chicago Lantern Slide Club.
Chicago. Organized December, 1886.
President—E. D. Fisk. *Treasurer*—C. H. Gould.
Secretary—Dr. John Nicol, 185 Wabash Ave., Chicago, Ill.

Place of Meeting, Art Institute. Ordinary Meetings, third Tuesday of each month. Membership, September 1, 50.

Bridgeport Camera Association.
Bridgeport, Conn. Organized April 26, 1887.
President—Chas. C. Godfrey, M.D.
Vice-President—Geo. K. Birdseye.
Executive Committee—C. C. Godfrey, G. K. Birdseye, S. S. Sanford, W. H. Lamson, C. H. Armstrong.
Treasurer—Geo. H. Johnson.
Secretary—A. D. Lewis, Drawer 23, Bridgeport, Conn.

Place of Meeting, Society's rooms, Golden Hill and Middle Sts. Ordinary Meetings, fortnightly Tuesdays at 8 P. M. Membership, September 1 : Associate, 4 ; active, 17 ; total, 21.

Cleveland Camera Club.
Cleveland, O. Organized January 25, 1887.
President—Rev. Dr. Chas. S. Pomeroy.
Vice-President—Dr. Robt. Dayton. *Treasurer*—Arthur D. Cutter.
Secretary—Wm. T. Higbee, 721 Prospect St., Cleveland, Ohio.

Place of Meeting, 13 Euclid Ave. Ordinary Meetings, first and third Tuesdays of each month at 8 o'clock P. M. Annual Meeting, first Tuesday in January. Membership, September 1 : Active, 21.

Grand Rapids Photographic Club.

Grand Rapids, Mich. Organized May 18, 1887.

President—Dr. J. C. Parker.
Executive Committee—Dr. J. C. Parker, A. B. Richmond, A. A. Barr.
Treasurer and Librarian—A. A. Barr.
Secretary—A. B. Richmond, 4 Monroe St., Grand Rapids, Mich.

Place of Meeting, 72 Canal St. Ordinary Meetings, first and third Monday evenings in each month. Annual Meeting, May 18. Membership, September 1: Honorary, 3; active, 18; total, 21.

Texas State Photographers' Association.

Galveston. Organized Aug. 6, 1887.

President—J. H. Webster. *Vice-President*—G. C. Rhine.
Executive Committee—H. B. Hillger, A. R. Billows, S. T. Blessing.
Treasurer—S. J. Blessing.
Secretary—C. F. Cooke.

New Haven Camera Club.

New Haven, Conn. Organized Nov. 16, 1886.

President—Dr. Moses C. White.
Vice-President—Chas. B. Matthewman.
Executive Committee—J. F. Malone, W. H. Seward, Jr., F. H. Cogswell, J. Waldo Jewett, M.D., E. F. Mansfield, E. S. Farrington.
Treasurer—F. A. Jackson.
Librarian and Secretary—J. H. Sherman, U. S. Signal Office, New Haven, Conn.

Place of Meeting, 21 Insurance Building. Ordinary Meetings, first Monday in every month. Special Meetings, every Wednesday. Membership, September 1: Honorary, 1; active, 26; total, 27. Exhibitions held at irregular intervals.

New England Photographers' Association.

Boston, Mass. Organized 1868.

President—H. W. Whitney, 563 Main St., Cambridge, Mass.
Treasurer—Geo. H. Whitney, Cambridge, Mass.
Acting Secretary.—A. A. Glines, P. O. Box 582, Newton, Mass.

Place of Meeting, 333 Washington St., Boston. Ordinary Meetings, first Monday, monthly, except in summer. Special Meetings, at call of President. Annual Meeting, April. Membership, September 1: Honorary, 6; active, 40; total, 46.

The Brooklyn Academy of Photography.

Brooklyn, N. Y. Organized Feb., 1887.

President—Wallace Goold Levison.
Vice-Presidents—Frank La Manna, James Lefferts Cornell, Edgar Jefferson Taylor.
Council—Five Councilors and Board of Officers.
Treasurer—Edward H. Quantin. *Librarian*—John Lefferts, Jr.
Recording Secretary—Adrian V. Martense, 213 Montague St., Brooklyn.
Corresponding Secretary—Willis Dodge, 346 Schermerhorn St., Brooklyn.

Place of Meeting, varies with the occasion. Ordinary Meetings, on call of President or Council. Annual Meeting, first Wednesday of February. Membership, September 1: Active, 31. Spring Exhibition projected for 1888.

Providence Amateur Photographic Association.

Providence, R. I. Organized Feb., 1884.

President—R. Clinton Fuller. *Vice-President*—L. L. Anderstrom.
Executive Committee—The President, Secretary, R. L. P. Mason, E. Q. Gladding, H. R. Guild, C. I. Gorham.
Treasurer—E. A. Barrows. *Librarian*—F. L. Hinckley.
Room Committee—R. C. Fuller, E. Q. Gladding, C. I. Gorham.
Secretary—R. W. Taft, 97 Waterman St., Providence, R. I.

Place of Meeting, 81 North Main St. (Room 1). Ordinary Meetings, first Saturday and the Tuesday after the third Saturday at 7.30 P. M. Annual Meeting, March. Membership, September 1: Honorary, 1; active, 32; total, 33. Exhibitions—Fourth Annual will be held the first week in December, 1887. One or two lantern exhibitions will be held during the winter. Annual excursion in May (Decoration Day), 1888.

The New Orleans Camera Club.

New Orleans, La. Organized Dec. 11, 1886.
President—Dr. W. R. Mandeville. *Vice-President*—Rev. D. L. Mitchell.
Treasurer—H. T. Howard.
Secretary—Wm. W. Crane, care Club, Tulane University, New Orleans, La.

Place of meeting, Tulane University. Ordinary meetings, third Wednesday—monthly. Special meetings, first, second, and fourth Wednesdays of each month.

International Photographic Exchange.

F. C. Beach, New York, 361 Broadway.
Richard H. Lawrence, New York.
Henry Smith, Winshade, Friern Park, North Finchley, England.

Exchange of lantern slides made yearly.

Asheville Amateur Photographic Association.

President—Roger Davis. *Vice-President*—Dr. J. H. Williams.
Secretary—F. L. Jacobs.

The Argents.

Washington, D. C.

Secretary—Edgar Richards, Treasury Department, Office Internal Revenue, Washington, D. C.

Photographic Section, Rochester Academy of Science.

President—G. H. Croughton. *Vice-President*—J. J. Hagreen.
Secretary—Milton B. Punnett, 30 Magnee St., Rochester, N. Y.

Minneapolis Camera Club.

Minneapolis. Established September, 1885.

President—Mr. Cleveland. *Vice-President*—F. Reed.
Secretary—C. A. Hoffman. *Treasurer*—O. M. Caraway.
20 and 22 Fourth Street, South.

The Indianapolis Camera Club.

President—Tom E. Hibben. *Vice-President*—Ben D. Walcott.
Secretary—Carl H. Lieber *Treasurer*—R. R. Bennett.
Executive Committee—Chas. McBride, J. D. W. Ashton, Geo. S. Webster, Dr. J. R. Haynes, Chas. Reitz.

Organized November 25 ; 23 active members.

EUROPEAN PHOTOGRAPHIC SOCIETIES.

English.

ABERDEEN AND NORTH OF SCOTLAND AMATEUR PHOTOGRAPHIC ASSOCIATION.

Robert Houston, 1 Millburn St., Aberdeen.
Meets once a month, from October to April.

AMATEUR PHOTOGRAPHIC ASSOCIATION.

25 Old Bond St., London, W.

AMATEUR PHOTOGRAPHIC FIELD CLUB.

London. Organized 1852.

President—J. M. Brownrigg.
Secretary—W. Wainwright, Jr., Hoe Place, Woking.

Monthly outings in the Summer. Technical meetings during Winter months. Annual Meeting, November. Membership, September 1 : Honorary, 2 ; active, 23 ; total, 25. Club limited to 25 members. Exhibitions held annually in November ; competition amongst members ; lantern slide competition in April.

BIRKENHEAD PHOTOGRAPHIC ASSOCIATION.

Birkenhead. Organized 1884.

President—John H. Day. *Vice-President*—Paul Lange.
Council—J. M. Jones, G. A. Kenyon, B. J. Sayce, J. A. Forrest, H. H. Williams, W. P. Riley, R. W. Hill, T. C. James, F. Evans, A. W. Cornish, and P. H. Phillips.
Treasurer—E. Whalley.
Secretary—George A. Carruthers, Woodhey Rock Ferry.

Place of Meeting, Free Public Library. Ordinary Meetings, second Thursday in each month. Annual Meeting in October. Membership, September 1, 70.

BOLTON PHOTOGRAPHIC CLUB.

James Slater, Town Hall Square, Bolton.
Meets every Tuesday.

BOLTON PHOTOGRAPHIC SOCIETY.

C. K. Dalton, 50 High Bridge St., Bolton.
Meets first Thursday from September to May.

BRADFORD AMATEUR PHOTOGRAPHIC SOCIETY.

George D. Scorah, 11 Leeds Road, Bradford.
Meets second Thursday.

BRISTOL AND WEST OF ENGLAND AMATEUR PHOTOGRAPHIC ASSOCIATION.

H. A. Hood Daniel, "Chasefield," Fishponds, near Bristol.
Meets fourth Wednesday.

BURTON-ON-TRENT INSTITUTE AMATEUR PHOTOGRAPHIC ASSOCIATION.

Burton-on-Trent. Organized, 1883.

President—Rev. J. Bramell.
Executive Committee—J. Gill, T. Gretton, J. Stirk.
Treasurer—A. R. Siddals.
Secretary—S. Sims, 56 Branstone Road, Burton-on-Trent.

Place of Meeting, Institute, Union St. Ordinary Meetings, fourth Thursday each month. Annual Meeting, December.

BURY PHOTOGRAPHIC AND ARTS CLUB.

F. W. Livsey, Victoria Terrace, Walmersley Road, Bury.
Meets third Thursday.

BURNLEY AND DISTRICT AMATEUR PHOTOGRAPHIC SOCIETY.

Burnley, Lancashire. Organized April, 1885.

President—J. Butterworth, J. P. *Vice-President*—D. Drew.
Executive Committee—J. Pickles, J. W. Houlden, J. Holgate.
Treasurer and Secretary—William Sutcliffe, 7 Bank Hall Terrace, Burnley, England.

Place of Meeting, Mechanics' Institution. Ordinary Meetings, third Wednesday in each month except May, June, July, August, and September at 8 P. M. Annual Meeting, March 30th. Membership, September 1: Honorary, 4; active, 22; total, 26. Exhibitions, January 19th, 20th, and 21st, 1888.

CAMBRIDGE UNIVERSITY PHOTOGRAPHIC SOCIETY.

A. Hamilton, Christ's College, Cambridge University.

COVENTRY AND MIDLAND PHOTOGRAPHIC SOCIETY.

Coventry. Organized 1883.

President—Councillor Andrews.
Vice-Presidents—T. Boynton and H. N. Jones.
Executive Committee—T. Lloyd, T. Owen, C. Waters, G. Winstanley, and the whole of officers.
Treasurer—E. J. Walker.
Secretary—J. S. Weatherilt, Spring Hill House, Keresley, W. Coventry.

Place of Meeting, Provident Dispensary. Ordinary Meetings, first Wednesday in each month at 8 P. M. Annual Meeting, December; date fixed at previous ordinary meeting. Membership, September 1: Active, 20.

CAMERA CLUB.

London, W. C. Organized 1885.

President—Captain W. de W. Abney, R. E., F. R. S.

Committee—Frederic Machell Smith, Chairman ; William Adcock, William K. Burton, John Beverley Campbell, Lyonel Clark, Francis Cobb, John France Collins, Arthur Robert Dresser, John Duncuft, P. H. Emerson, Enrico Ferrero, J. Gale, Herbert James Gifford, William Asbury Greene, Dodgson Harbord. Charles William Hastings, William Henry Hyslop, Horace Handley O'Farrell, Sydney Platt, J. P., Douglas Pound Rodgers, Henry Stevens, Felix Joseph Vergara, Maj. George Hope Verney.

Bankers—Messrs. Martin & Co. *Librarian*—H. H. O'Farrell.

Secretaries—G. Davison, E. G. Spiers.

Place of Meeting, 21 Bedford St., London, W. C. Ordinary Meetings, Thursday evenings from October to April at 8 P. M. Musical evenings first Monday in every month from October to April at 8 P. M. Club excursion meetings in Summer. Annual Meeting, February. Membership, September 1 : Honorary, 5 ; active, 350 ; total, 355. Publications, *Club Journal of Proceedings* issued monthly free to members. Annual members' exhibition in connection with annual general meeting and conference organized under the auspices of the Club.

CARLISLE AND COUNTY AMATEUR PHOTOGRAPHIC SOCIETY.

H. Y. Thompson, Brampton, Cumberland.

Meets first Tuesday during the winter.

DERBY PHOTOGRAPHIC SOCIETY.

Derby. Organized May 21, 1884.

President—Capt. W. de W. Abney, R. E., F. R. S., etc.

Vice-Presidents—Richard Keene, J. C. Merry, J. W. Price, and T. Scotton.

Executive Committee—C. Bourdin, H. Bennett, T. Hills, W. G. Haslam, C. B. Keene.

Treasurer and Secretary—Edward J. Lovejoy, 73 Grove St., Derby, Eng.

Place of Meeting, Sykes's Restaurant, 33 Victoria St., Derby. Ordinary Meetings, second Tuesday in each month at 8 P. M. Annual Meeting, second Tuesday in October at 8 P. M. Membership, September 1 : Active, 101. Exhibitions, annual conversazione in January ; date varies.

DUNDEE AND EAST OF SCOTLAND PHOTOGRAPHIC ASSOCIATION.

President—W. D. Valentine.

D. Ireland, Jr., Commercial St., Dundee.

Meets first Thursday from October to May.

EDINBURGH PHOTOGRAPHIC SOCIETY.

President—William Forgan.

Secretary—G. G. Mitchel, 3 Gladstone Place, Edinburgh.

Meets first Wednesday from October to June.

EDINBURGH PHOTOGRAPHIC CLUB.

Edinburgh. Organized 1881.

Treasurer—James C. H. Balmain. *Convener*—Dr. John Thomson, R. N.
Secretary—James Jameson, 84 Pitt St., Edinburgh, N. B.

The Ordinary Meetings are held at 5 St. Andrews Square at 8 o'clock P. M. on the third Wednesday of each month. The Annual Meeting on the third Wednesday of November. The Club is limited to thirty members.

GLASGOW AND WEST OF SCOTLAND AMATEUR PHOTOGRAPHIC ASSOCIATION.

President—William Lang, Jr.
Secretary—William Goodwin, Glasgow.
Meets third Tuesday from October to April.

GLASGOW PHOTOGRAPHIC ASSOCIATION.

John Lenox, 6 Armadale St.
Meets first Thursday from September to April.

GLOSSOP DALE PHOTOGRAPHIC SOCIETY.

W. Rowcliffe, Gamesley House, Denting.
Meet first Tuesday.

HOLMFIRTH AMATEUR PHOTOGRAPHIC SOCIETY.

Secretary—F. Brownson.
Meets first Tuesday.

HALIFAX PHOTOGRAPHIC CLUB.

Halifax, Yorkshire. Organized 1881.

President—B. Rowley.
Vice-Presidents—T. Illingworth and E. J. Smith.
Executive Committee—The officers and the following: H. Y. Mossman, Major Halroyde, Jos. Whiteley, B. B. Bingley, and Councillor J. Smith.
Treasurer—G. Hargreaves Jackson. *Auditor*—S Goodman.
Secretary—W. Clement Williams, 13 Akeds Road, Halifax, England.

Place of Meeting, Mechanics' Hall. Ordinary Meetings, third Thursday in each month. Annual Meeting, October.

HALIFAX PHOTOGRAPHIC SOCIETY.

Luther Hanson, 36 North Parade, Halifax.
Meets first Friday.

HYDE PHOTOGRAPHIC SOCIETY.

John Pennington, Great Norbury St., Hyde, Manchester.

HULL AMATEUR PHOTOGRAPHIC SOCIETY.

Hull. Organized 1884.

President—Sir A. K. Nollitt, M. P. *Vice-President*—C. F. Amos.
Council—Geo. Bohn, Rev. G. Shafto, C. D. Holmes, J. Stothard, G. Shackles, J. Campbell Thompson.
Treasurer—H. W. N. Smith. *Librarian*—B. M. Stoakes.
Joint Honorary Secretaries—D. W. Sessons and H. W. N. Smith, 84 Beverley Road, Hull, Eng.

Place of Meeting, Hull Royal Institution. Meetings held irregularly. Annual Meeting, November. Membership, September 1: Active, 30. An exhibition will probably be held November, 1887.

LEEDS PHOTOGRAPHIC SOCIETY.

Thomas W. Thornton, 22 Carr Road, Leeds.
Meets first Thursday.

LIVERPOOL AMATEUR PHOTOGRAPHIC ASSOCIATION.

W. A. Watts, Charlesville, near Liverpool.

LONDON AND PROVINCIAL PHOTOGRAPHIC ASSOCIATION.

London. Organized 1882.

Trustees—J. Traill Taylor, J. B. B. Wellington.
Executive Committee—W. M. Ashman, J. Bolas, P. A. Bridge, J. J. Collins, A. Mackie, L. Medland, H. M. Smith, C. H. Trinks.
Tresaurer—W. H. Prestwich. *Librarian*—A. Haddon.
Secretary—J. J. Briginshaw, 128 Southwark St., London.

Place of Meeting, Mason's Hall Tavern. Ordinary Meetings, Thursday evenings at 8 o'clock. Annual Meeting, last Thursday in June. Membership, September 1: Active, 150.

MANCHESTER PHOTOGRAPHIC SOCIETY.

W. I. Chadwick, Brooklands, near Manchester.
Meets second Thursday from September to May. Lantern Meetings fourth Wednesday.

MANCHESTER AMATEUR PHOTOGRAPHIC SOCIETY.

President—Rev. J. H. Palmer.
Secretary—F. W. Parrott, 53 Chapel St., Salford.

NORTH STAFFORDSHIRE AMATEUR PHOTOGRAPHIC ASSOCIATION.

President—Charles Alfieri.
Secretary—W. B. Allison, 32 West St., Stoke-on-Trent.
Meets first Wednesday.

NEWCASTLE-ON-TYNE AND NORTHERN COUNTIES PHOTOGRAPHIC ASSOCIATION.

John Pike, 43 Northcote St., Newcastle-on-Tyne.
Meets second Tuesday from October to May.

NORTH LONDON AMATEUR PHOTOGRAPHIC ASSOCIATION.

President—J. Humphries.
H. M. Smith, 5 Beatrice Road, Stroud Green, N., London.
Meets first and third Tuesday.

NOTTS PHOTOGRAPHIC ASSOCIATION.

President—K. Blendy.
Secretary—George Edward Inger, 7 High St., Nottingham.
Meets Tuesdays from October to April.

OLDHAM PHOTOGRAPHIC SOCIETY.

President—John Greaves, Jr.
Secretary—Thomas Widdop, 18 Crossbank St., Oldham.
Meets last Thursday.

OXFORD UNIVERSITY PHOTOGRAPHIC CLUB.

President—G. S. Edwards.
Secretary—E. W. Bennett, New College.
Meets every other Friday during the Term.

PAISLEY PHOTOGRAPHIC SOCIETY.

W. Peock, Meikleriggs.
Meets first Tuesday.

PHOTOGRAPHERS' BENEVOLENT ASSOCIATION.

H. Harland, 181 Aldersgate St., E. C., London.
Meets first Wednesday.

PHOTOGRAPHIC CLUB.

London. Organized 1879.

Executive Committee—W. Bedford, E. W. Toxler, J. B. B. Wellington. W. Cobb, A. Mackie, W. J. Zaehnsdorf, A. Cowan, J. Nesbit.
Trustees—W. Ackland, T. Charters White.
Trreasuer—Edward Dunmore. *Librarian*—Edgar Clifton.
Curator—H. M. Hastings, F. I. C.
Secretary—Edward Dunmore, 1 Beacon Hill, London, N.

Place of Meeting, Anderton's Hotel, Fleet St., E. C. Ordinary Meetings, every Wednesday at 8 o'clock P. M. Annual Meeting, first Wednesday in November. A private exhibition in December and smoking concert combined.

PHOTOGRAPHIC SOCIETY OF GREAT BRITAIN.

Edwin Cocking, 5A Pall Mall East, S.W., London.
Meets second and fourth Tuesdays, except second Tuesdays in July, August, September, and October.

PHOTOGRAPHIC SOCIETY OF IRELAND.

Dublin. Organized 1879.

President—J. Emerson Reynolds, F. R. S.
Vice-President—Sir Howard Grubb, F. R. S.
Executive Council—Samuel Baker, Herbert Bewley, Thos. Mayne, M. P., Litzadam Millar, Geo. Mansfred, W. G. Pim, J. L. Robinson, J. V. Robinson, Dr. Scott, Joseph H. Woodworth.
Treasurer—Thos. A. Bewley.
Secretaries—Alexander Conan, 1 Carlton Villas, Shelbourne Road, Dublin, and E. P. Johnson, 30 Upper Mount St., Dublin.

Place of Meeting, Royal College of Science, Dublin. Ordinary Meetings, second Friday of month, October to May, inclusive, at 8 P. M. Annual Meeting, second Friday in November. Membership, September 1, 87; no classification. Exhibitions, triennial; preparing now for one to open in November in the rooms of the Royal Hibernian Academy of Arts, Dublin.

POSTAL PHOTOGRAPHIC SOCIETY.

British Islands. Organized July, 1882.

President—Horace Day, M. D.
Executive Committee—A. Bryans, Rev. W. Barnes, H. N. Malan, R. Tindall, and Walter Withall.
Secretary—Wm. Mortimer Baylis, 4 Middle Temple Lane, London, E. C.

Place of Meeting, above address. Committee Meetings, four times a year. Annual Meeting, June in each year. About 70 members. Albums are sent round to each member in turn, containing prints contributed by the members themselves. Note books accompany for criticism, etc., and each member votes as to how the two prizes given in every album are to be awarded.

SHEFFIELD PHOTOGRAPHIC SOCIETY.

Joseph Taylor, Holland Place, London Road, Sheffield.
Meets first Tuesday.

SOUTH LONDON PHOTOGRAPHIC SOCIETY.

President—H. Trueman Wood.
Secretary—F. A. Bridge, East Lodge, Dalston Lane, London, E.
Meets first Thursday from October to June.

THE CHELTENHAM PHOTOGRAPHIC SOCIETY.

Cheltenham. Organized 1865.

President—Major-General F. Dawson, C. B.
Executive Committee—Baynham Jones, G. S. Penny, W. C. Beetham.
Treasurer—John Bull.
Secretary—Clifford E. F. Nash, M. A., Glenfall Lawn, Cheltenham.

Place of Meeting, No. 4 Clarence St. Ordinary Meetings, second Thursday in each month, at 7:30 P. M., from 1st November until 1st April. Special Meetings, 1st November to appoint committee; second Thursday in March to arrange excursions. Annual Meeting, 1st November. Membership, September 1: About 20 members, all active. Publications, occasional papers and proceedings in photographic journals. Exhibitions, none; the work of the members is generally exhibited at ordinary meetings.

MANCHESTER AMATEUR PHOTOGRAPHIC CLUB.

Manchester. Organized 1883.

Council—J. W. Leigh, T. Sefton, T. W. Steventon, J. T. Foster, J. G. Jones.

Treasurer and Secretary—E. Openshaw.

Place of Meeting, Star Hotel, Deansgate, Manchester. Ordinary Meetings, third Wednesday in each month. Membership limited to 30 members.

THE PHOTOGRAPHIC CONVENTION OF THE UNITED KINGDOM.

Established 1886.

Secretary and Treasurer—J. J. Briginshaw, 128 Southwark St., S. E., London, Eng.

The 1888 meeting will be held at Birmingham for one week during the month of August.

WEST RIDING OF YORKSHIRE PHOTOGRAPHIC SOCIETY.

J. Crosthwaite, 46 Great George St., Leeds.
Meets first Monday October to May.

YORKSHIRE COLLEGE PHOTOGRAPHIC CLUB.

President—Ch. Bothamley.

Secretary—Harry B. Hall, Leeds.

Meets last Thursday of the month during College Session.

Australian.

AMATEUR PHOTOGRAPHIC ASSOCIATION OF VICTORIA.

J. H. Harvey, Melbourne, Australia.
Meets first Monday in month.

New Zealand.

AUCKLAND PHOTOGRAPHIC SOCIETY.

Secretary—J. H. Sinclair, Auckland, New Zealand.

WELLINGTON AMATEUR PHOTOGRAPHIC SOCIETY.

Secretary—W. Williams, Wellington, New Zealand.

Indian.

THE PHOTOGRAPHIC SOCIETY OF INDIA.

Secretary—A. Flemming, 8 Clive St., Calcutta, India.
Exhibition, January, 1888.

German.

PHOTOGRAPHISCHE GESELLSCHAFT.

Vienna. Organized 1861.

President—Ottomar Volkmer. *Vice-President*—Achilles von Melingo.
Treasurer—Ludwig Schrank. *Secretary*—Professor Fritz Luckhardt.

Place of Meeting, Academie der Wissenschaften. Ordinary Meetings, first Tuesday of every month. Annual Meeting, January. Membership, September 1: Honorary, 14; active, 470; total, 484. Publications, *Photographische Correspondenz.* Exhibitions, every meeting.

PHOTOGRAPHEN VEREIN ZU BERLIN.

Berlin. Organized 1863.

President—Dr. F. Stolze. *Vice-Presidents*—Dr. Jul. Stinde, Capt. Kiss.
Council—C. Brash, G. Braun, C. Georgi, F. Grundner, J. Junk.
Treasurer—E. Martini.
Secretaries—1. A. W. Schwartz; 2. H. Bock; 3. Dr. F. Stolze, 18 Blumenthaler Strasse, Berlin, W.

Membership, September 1, 217.

VEREIN ZUR FOERDERUNG DER PHOTOGRAPHIE.

Berlin. Organized 1869.

President—Prof. Dr. H. W. Vogel. *Vice-President*—Dr. W. Zenker.
Executive Committee—Nalwas, Graf, Milster, Naberland, Christmann.
Treasurer—Bergmann J. F. F. Bupide. *Librarian*—Haberland.
Secretaries—Schultz, Nencke, Christmann.

Place of Meeting, Wolhdenstr 92, Künsterhaus, Berlin. Ordinary Meetings, each second and fourth Friday of the month. Membership, September 1: Honorary, 5; active, 302; total, 307. Publications, *Photographische Mittheilungen*, edited by Dr. H. W. Vogel; published by R. Oppenheim, Berlin; 24 numbers yearly.

PHOTOGRAPHISCHE GESELLSCHAFT, HAMBURG-ALTONA.

Hamburg. Organized 1873.

President—G. Wolf. *Vice-President*—Th. Petersen.
Treasurer—F. Koehner. *Librarian*—C. W. Lueders.
Recording Secretary—H. Faerber.
Corresponding Secretary—H. Book, care of F. W. Brenning's widow, 26 Bergstrasse, Hamburg.

VEREIN ZUR PFLEGE DER PHOTOGRAPHIE UND VERW. KUENSTE.

Frankfurt-on-the-Main. Organized 1875.

President—J. Bamberger.
Council—C. Reutlinger, H. Maas, W. Poellot (Darmstadt), H. von Ayx (Mainz).
Treasurer—C. Böttcher. *Librarian*—Dr. C. Schleussner.
Secretaries—(1) F. W. Geldmacher; (2) Th. Haak, Oppenheimer Landstrasse, No. 73.

Membership, September 1, 230.

RHEINISCH-WESTPHAELISCHER VEREIN ZUR PFLEGE DER PHOTOGRAPHIE UND VERW. KUENSTE.

Cologne-on-the-Rhein. Organized 1876.

President—Th. Creifeld. *Vice-President*—Th. Schoenscheid.
Council—C. Baumann, O. Vertendorp.
Secretaries—J. Janssen, Ad. Cohn.

Membership, September 1, 66.

DEUTSCHER PHOTOGRAPHEN VEREIN.

Weimar. Organized Dec. 29, 1876.

President—K. Schwier, Weimar. *Vice-President*—Cr. Müller, München.
Executive Committee—C. Kindermann, Hamburg ; Gz. Brobcock, Leipzig.
Treasurer—Karl F. Wunder, Hannover.
Secretary—F. Tellgmann, Mühlhausen, Thüringen.

Annual Meeting, August, 1888, in Lübeck. Membership, September 1 : Honorary, 2 ; active, 514 ; total, 516. Publications, *Deutsche Photographen Zeitung.*

PHOTOGRAPHEN VEREIN ZU NUERNBERG.

Nuernberg. Organized 1879.

President—J. O. Schmidt, Jr. *Vice-President*—Fr. Schoeninger.
Treasurer—Fr. Murcat.
Secretaries—Lor. Strunz, Fr. Schoeninger, Ludwig Strasse.

Membership, September 1, 16.

MUENCHENER PHOTOGRAPHISCHE GESELLSCHAFT.

Munich. Organized 1879.

President—F. Werner. *Treasurer*—O. Perutz.
Secretary—Paul Zschokke, 31 Landwehr Strasse.

Membership, September 1, 35.

SCHLESWIG-HOLSTEIN PHOTOGRAPHEN VEREIN.

Flensburg. Organized 1881.

President—Koch. *Vice-President*—H. Speck.
Treasurer—Autzen. *Librarian*—Eilmann.
Secretary—Wilhelm Dreesen, Flensburg.

VEREIN PHOTOGRAPHISCHER MITARBEITER.

Vienna. Organized Dec. 1, 1882.

President—Ernest Hawelka. *Vice-President*—Josef Schaschek.
Oursschrifomitgtrader—Carl Beck, Leo Heitel, Hans Lenhard, Franz Müllner, Carl Körber, Conrad Klazar, C. Thiefs, A. Schild, O. Pustet, J. Reich, W. Wohlers.
Treasurer—Leopold Stockmann. *Librarian*—Franz Mullner.
Secretary—W. Weis.

Place of Meeting, Wien IV, Paniglgasse 17. Ordinary Meetings, every Monday evening. Membership, September 1 : Honorary, 1 ; active, 260 ; subscribing, 27 ; total, 288. Publications, *Der Photographische Mitarbeiter Zeitchrift für Photographen.* Herausgeber und Redacteur, Hans Lenhard.

GEHILFEN VEREIN ZU MAGDEBURG.

Magdeburg. Organized 1884.

President—H. Haase. *Secretary*—No. 15 Bismarck Strasse.

Membership, September 1, 35.

GEHILFEN VEREIN ZU DRESDEN.

Dresden. Organized 1885.

President—R. Apel. *Secretary*—No. 5. Prager Strasse.
Membership, September 1, 40.

PHOTOGRAPHISCHE GESELLSCHAFT VON ESSEN UND BENAHB. STADTEN.

Essen-on-the-Ruhr. Organized 1886.

President—E. Schink, Sen. *Vice-President*—L. Broker.
Council—T. Schneider, W. Spenghr, E. Schink, Jr.
Secretary—L. Broker, Essen-on-the-Ruhr.
Membership, September 1, 21.

PHOTOGRAPHEN VEREINIGUNG ZU MÜNCHEN.

Munich. Organized 1887.

President—Ad. Kaerntner. *Secretary*—No. 70 Hess Strasse.
Membership, September 1, 70.

GEHILFEN VEREIN ZU CHEMNITZ.

Chemnitz, Saxony. Organized 1887.

President—Franz Schulz.
Membership, September 1, 24.

GEHILFEN VEREIN ZU BERLIN.

Berlin. Organized 1887.

Persident—Emil Schröter.
Secretary—Steglitzer Strasse No. 35, Berlin, W.
Membership, September 1, 45.

DEUTSCHE GESELLSCHAFT VON FREUNDEN DER PHOTOGRAPHIE.

Berlin. Organized 1887.

Directors—Major Hedinger, Prof. Jacobsthal, E. Koerner, E. Kirchner, Dr. Lummer, E. Milster, Dr. Vogel, Schultz-Henke, Dr. Zenker.
Secretary—Dr. Zenker, 17 Wichmann Strasse, Berlin, S. E.
Membership, September 1, 91.

CLUB DER AMATEUR PHOTOGRAPHEN ZU WIEN.

Vienna, Austria. Organized 1887.

President—Carl Srna. *Vice-President*—Carl, Count Brandis.
Executive Committee—Alfred, Baron v. Liebig, M. Erich Condit, Cl. von Kneusel-Herdliezka, Ludw. Kapferer, Rudolf Count von Wilversheimb, Carl Schiendl, Capt. V. Toth, Carl Ulrich, Jos. Vogel.
Treasurer—Alfred Werner. *Librarian*—Dr. F. Mallmann.
Secretaries—(1) Victor Silberer, (2) Ernest Riek, 4 Wallfischgasse, Wien I.
Membership, September 1, 94.

SELBSTBILDUNGS UND UNTERSTUETZUNGS-VEREIN PHOTOGRAPHISCHER MITARBEITER.

Buda-Pesth, Hungary. Organized 1885.

President—Sigmund Horváth.
No. of members, 190.

GEHILFEN VEREIN ZU PRAG.

Prague, Bohemia. Organized 1882.

President—Jos. Koppel.
No. of members, 64.

Dutch.

AMATEUR FOTOGRAFEN VEREENIGING.

Amsterdam. Founded Sept. 1, 1887.

Secretary—J. J. Tutein, Nottenius Heerengracht 132, Amsterdam.
Meets monthly,

French.

SOCIETE FRANCAISE DE PHOTOGRAPHIE.

Paris. Organized Nov. 13, 1854.

President—M. Péligot (de l'Institut). *Vice-President*—M. A. Davanne.
Treasurer—M. Audra. *Librarian*—M. Bordet.
Secretary—M. Perrot de Chaumeux.

Place of Meeting, 20 Rue Louis le Grand. Ordinary Meetings, first Friday of every month except September and October. Membership, September 1: Honorary, 13; active, 365; total, 378. Publications, *Bulletin de la Société Française de Photographie* (monthly).

LA SOCIETE PHOTOGRAPHIQUE DU LUD-OUEST.

Organized May 1, 1884.

President—De la Laurencie (Comte de) á Sersae.
Vice-President—Durandeau, banker, Angouteme.
Treasurer—Lecanu.
Secretary—F. Braun, 61 Route de Perigueuse, Angouteme (Charente) France.

Place of Meeting, l' Hotel de Ville d'Angouteme. Ordinary Meetings, the first Saturday of each month. Special Meetings, the 15th of January, April, August and November. Membership, September 1: Honorary, 5; active, 54; corresponding, 1; total, 59. Publications, *Le Progrés Photographique*, published in Paris, 39 Rue Ramey.

SOCIETE GENEVOISE DE PHOTOGRAPHIE.

President—Henry Boissonnas. *Vice-Presidents*—H. Fatio, J. E. Sautter.
Treasurer—J. Jacquerod. *Librarian*—Ed. V. Boissonnas.
Secretary—Alb. Gampert, Citè 20, Geneve.

Place of Meeting, Grand Rue. Ordinary Meetings, last Thursday each month. Membership, September 1: Active, 45.

Russian.

FIFTH SECTION OF IMPERIAL RUSSIAN TECHNICAL SOCIETY.

Organized, 1878.

President—Lewitzki. *Vice-President*—Prof. V. Sresnevsky.
Executive Committee—Olchin, Chartulori, Sabanejéw, Tudoutory, Tchesterman.
Secretarv—Kondojanaki.

Place of meeting, S. Peterbourg Panteleimonskaia 2. Meetings, first Fridav evening of every month. Membership, September 1: Honorary, 5; active, 65; corresponding, 5; total, 75.

Norwegian.

PHOTOGRAPHIC SOCIETY OF CHRISTIANA.

Christiana, Norway. Organized Feb. 18, 1881.

President—L. Szacinsky. *Vice-President*—C. Wischmann.
Board of Managers—Officers. *Treasurer.*—C. G. Rude.
Secretary—H. Abel.

Place of Meeting, Christiana. Ordinary Meetings, first Tuesday of every second month. Membership, September 1: Honorary, 1; active, 32; total, 33.

PHOTOGRAPHIC SCHOOLS OF INSTRUCTION.

American.

THE CHAUTAUQUA SCHOOL OF PHOTOGRAPHY.

CHARLES WAGER HULL, *Superintendent.*
CHARLES EHRMANN, *Instructor.*

In Summer, at Chautauqua Assembly Grounds, New York. In Winter, classes by correspondence.

Instruction is also given in Photography at Wilson College, Chambersburg, Pa., by Miss Harriet Seymour; at Montclair, N. J., High School, by Randall Spaulding; at Lehigh University, Pa., and Cornell University, N. Y., and at a Summer School at Mountain Lake, Md., by Prof. Charles F. Hines.

European.

VIENNA "LEHR UND VERSUCHS-AUSTALT FÜR PHOTOGRAPHIE UND REPRODUCTIONS VERFAHREN."

25, Westbahnhof, Wien IV.

PROF. DR. EDER.

GROENENBACH (BAYER-ALLGAU), GERMANY.

W. CRONENBERG.

DARMSTADT POLYTECHNICAL HIGH SCHOOL.

CHARLOTTENBURG, GERMANY. POLYTECHNICAL HIGH SCHOOL.

Prof. DR. H. W. VOGEL.

PHOTOGRAPHIC DEPARTMENT OF THE TECHNICAL HIGH SCHOOL OF KARLSRUHE, BADEN.

Director—Prof. DR. HART.
Instructor—F. SCHMIDT.

A.—Winter session from October 1 to March 15.
B.—Summer " April 16 to August 1.

PHOTOGRAPHIC PERIODICALS.

AMERICAN.—WEEKLY.

The Photographic Times and American Photographer. Scovill Mfg. Co., W. I. Lincoln Adams, Editor, 423 Broome Street, New York.

The Photographic Eye. C. Gentilé, Editor, 81 State Street, Chicago, Ill.

SEMI-MONTHLY.

The Philadelphia Photographer. Edward L. Wilson, 853 Broadway, New York.

Anthony's Photographic Bulletin. E. & H. T. Anthony & Co., 591 Broadway, New York.

MONTHLY.

The Photographic Times. (Monthly parts.)

The St. Louis Photographer. Mrs. Fitzgibbon-Clark, 2234 Olive Street, St. Louis, Mo.

The Photographic Beacon. Dr. John Nicol, 185 Wabash Avenue, Chicago, Ill.

The American Journal of Photography. Thos. H. McCollin, 635 Arch Street, Philadelphia, Pa.

YEARLY.

The American Annual of Photography and Photographic Times Almanac. C. W. Canfield, Editor. Scovill Mfg. Co., 423 Broome Street, New York.

Photographic Mosaics. Edward L. Wilson, 853 Broadway, New York.

Walzl's Photographic Journal and the Photographer's Friend. R. Walzl, Baltimore.

ENGLISH.—WEEKLY.

The British Journal of Photography. Henry Greenwood & Co., 2 York Street, Covent Garden, London.

The Photographic News. Piper & Carter, 5 Furnival Street, Holborn, London, E. C.

The Amateur Photographer. C. W. Hastings, 22 Buckingham Street, Adelphi, London, W. C.

MONTHLY.

The Journal and Transactions of the Photographic Society of Great Britain. London.

Transactions of the Edinburgh Photographic Society. G. G. Mitchell, Hon. Secretary, 20 George Street, Edinburgh, Scotland.

Proceedings of the Glasgow Photographic Association. John Lenox, 6 Armadale Street, Glasgow, Scotland.

The Photographer's World. Percy Lund & Co., Ilkley, Yorkshire.

The Camera. 15 Bedford Street, Covent Garden, London, W. C.

YEARLY.

The British Journal Photographic Almanac. London. H. Greenwood & Co., 2 York Street, Covent Garden, London.

The Year Book of Photography and the Photographic News Almanac. London: Piper & Carter, 5 Furnival Street, London.

GERMAN.—WEEKLY.

Deutsche Photographen-Zeitung. K. Schwier, Weimar. Est. Oct. 1, 1877.

Photographisches Wochenblatt. Dr. F. Stolze, Berlin, S. W., Hallesche Str. 4. Est. 1875.

FORTNIGHTLY.

Photographische Mittheilungen. Prof. Dr. H. W. Vogel, Editor. Robert Oppenheim, Publisher, Berlin. Est. April 1, 1864.

Photographisches Archiv. Dr. E. Liesegang, Düsseldorf, Editor. Est. 1860.

MONTHLY.

Photographische Correspondenzen. Ludwig Schrank, Wein III, Haupsstrasse, 9. Est. 1864.

Photographische Notizen. C. Schierer, Wein I, 9 Tuchlauben. Est. 1865.

Photographischer Beobachter. C. Groll, Guben. Est. 1880.

Der Photographische Mitarbeiter. Hans Lenhard, Wein III, Rennweg 57. Est. 1885.

Photographische Rundschau. Editor, C. Scheindl. Publisher, Carl Srna, Vienna I, Wohlfischgasse, 4. Begun Jan. 1, 1887.

Der Amateur Photograph. E. Liesegang, Düsseldorf. Begun Jan. 1, 1887.

OCCASIONAL.

Photographischer Anzeiger (advertising). Friedr. Stern, Munich, Sendlingshofer Platz, 9.

Flugblätter für Practische Photographie und verwandte Fächer. Friedrich Stern, München.

Der Practishe Photograph. Julius Pfeiffer, Breslau, Lehmdamm, 64.

Allgemeiner Anzeigerfür Photographen. Ad. Krieg, Dresden.

YEARLY.

Deutscher Photographen-Kalender. Weimar. Editor, K. Schwier. Publisher, *Deutsche Photographen Zeitung.* Est. 1880.

Photographischer Almanach und Kalender. Düsseldorf. Ed. Liesegang. Est. 1860. Suspended, 1863–1882.

Jahrbuch für Photographie und Reproductionstechnik. Dr. Josef Maria Eder, Editor. Published by W. Knapp, Halle, a. S. Est. 1887.

FRENCH.—WEEKLY.

L'Amateur Photographe. G. Rongier, 8, Place de l'Odeon, Paris.

FORTNIGHTLY.

Le Moniteur de la Photographie. L. Vidal, 13, Quai Voltaire, Paris.

MONTHLY.

Bulletin de la Société Française de Photographie. Rue Louis le Grand, 20, Paris.

Le Progrès Photographique. 22, Passage des Petites-Ecuries, Paris. Leon Wulff, Editor. Est., 1884.

Revue Photographique. E. Letellier, Editor, 11 Rue des Pénitents, Havre.

Bulletin de la Société Photographique de Toulouse. Toulouse.

Bulletin Belge de la Photographie. Pub.: M. J. Petit, Brussels.

Journal de l'Industrie Photographique. Gauthier-Villars, 55 Quai d'Augustin, Paris.

Bulletin de l'Association Belge de Photographie. O. Campo, 37, Rue Souveraine, Brussels, Belgium.

Bulletin Official de la Société des Employés en Photographie. 15, Rue Breda. Paris.

Journal de la Photographie Appliquée aux Sciences d'Observation. 12 Rue Hautefeuille, Paris.

Bulletin de la Société Versaillaise.

YEARLY.

Aide Mémoire de Photographie. Gauthier-Villars, 55 Quai d'Augustin, Paris, Publisher. C. Fabre, Editor.

L'Agenda de l'Amateur Photographie. G. Rougier, 8 Place de l'Odeon, Paris.

Carnet du Photograph-Amateur, Pour l' annèe, 1887. Charles Jacob. 126 pp. Paris, J. Michelet.

DUTCH.—MONTHLY.

Tidschrift voor Photographie. A. W. Groote, Amsterdam.

De Navorscher op het Gebied der Photographie. Amsterdam.

Fotografisch Maandblad. Organ of Amateur Fotografen Vereeniging of Amsterdam.

DANISH.—MONTHLY.

Beretninger fra Dansk Fotografisk Forening, Kopenhagen. J. Petersen, Ostergade, 34. A. E. M. Schleisner, Editor.

Fotografiske Meddelesse, Kopenhagen.

HUNGARIAN.—MONTHLY.

Fényképészéti Lapok. Fr. Veress, Klausenburg.

ITALIAN.—MONTHLY.

La Camera Oscura. G. Salvi, Prato, presso Firenze.

Rivisti Fotografica Universale, Brindisi. (Irregularly.)

SPANISH.—MONTHLY.

Boletin Fotografico. J. L. Lopez & Co., Box 213, Havana, Cuba.

Revista Fotografica Espanola of Estrangera. Gibraltar.

La Fotografia. Barcelona.

PORTUGUESE.

A Arte Photographica, Oporto, Cirne & Co., Rue da Picaria.

Boletin da Academia Portugueza de Amadores Photographicas.

RUSSIAN.

Der Photograph, Pantelemouskaja, No. 2, St. Petersburg.

Photographitscheski Westnik. Monthly. Ed., Paul Olchin; Pub., B. Sarnger & Co., St. Petersburg.

PHOTOGRAPHIC BOOKS PUBLISHED IN 1887.

ENGLISH.

TWELVE ELEMENTARY LESSONS ON SILVER PRINTING. Second Edition. New York. Scovill M'f'g Co.

THE FERROTYPERS' GUIDE. A manual of instruction by an active Ferrotyper. Seventh edition. New York. Scovill M'f'g Co.

HOW TO MAKE PICTURES. Fourth edition. Henry Clay Price. New York. Scovill M'f'g Co.

WILSON'S QUARTER CENTURY IN PHOTOGRAPHY. Edw. L. Wilson. New. York. Published by author.

PHOTOGRAPHIC PRINTING METHODS. Rev. W. H. Burbank. New York. Scovill M'f'g Co.

A HISTORY OF PHOTOGRAPHY. W. Jerome Harrison, F. G. S. New York. Scovill M'f'g Co.

NEGATIVE MAKING. Capt. W. de W. Abney. London. Piper & Carter.

THE PHOTOGRAPHER'S INDISPENSABLE HAND-BOOK. Compiled by Walter D. Welford; edited by Henry D. Sturmey. London. Iliffe & Son.

THE A B C GUIDE TO AUTOTYPE PERMANENT PHOTOGRAPHY. J. R. Sawyer. 2 Ills. London. The Autotype Co., 74 New Oxford St.

PRACTICAL AMATEUR PHOTOGRAPHY. C. C. Vevers. Leeds. Published by the author.

HARMONIOUS COLORING AS APPLIED TO PHOTOGRAPHS. Fourteenth edition. J. Newman, London.

THE A B C OF MODERN DRY-PLATE PHOTOGRAPHY. Twenty-second edition. London. The London Stereoscopic Co.

INSTANTANEOUS PHOTOGRAPHY FOR AMATEURS. C. W. Bath. Charles Seers.

THE ART OF PHOTOGRAPHIC PAINTING. A. H. Bool. London. Piper & Carter.

THE PHOTOGRAPHY OF BACTERIA. Edgar M. Crookshank. Ill. 86 photographs reproduced in autotype. 12s 6d. London. Lewis, 136 Gower St.

THE PRINCIPLES AND PRACTICE OF PHOTOGRAPHY. Jabez Hughes. Fourteenth edition; revised by J. Werge. London. Simpkin, Marshall & Co.

GUIDE TO THE SCIENCE OF PHOTO-MICROGRAPHY. Edward C. Bousfield. London. Kent & Co., 23 Paternoster Row.

THE AMATEUR'S FIRST HAND-BOOK. J. H. E. Ellerbeck. Fourth edition. Liverpool. Cussens, 79 Bold St.

PAPERS ON THE PHOTO-CHEMISTRY OF THE SILVER HALOIDS. By M. Carey Lea. (Reprinted from *American Journal Science*, May, June, and July.)

FIRST ANNUAL REPORT OF THE PHOTOGRAPHIC STUDY OF STELLAR SPECTRA (Henry Draper Memorial). Edward C. Pickering. With plate. Cambridge. John Wilson & Son.

PHOTOGRAHHY IN THE STUDIO AND IN THE FIELD. E. M. Estabrooke. Cloth. Ill. 238 p.p. 12 mo. $1.50. E. & H. T. Anthony & Co.

GERMAN.

DEUTSCHER PHOTOGRAPHENKALENDER, TASCHENBUCH UND ALMANACH für 1887, herausgegeben von K. Schwier. Preis 1 mark 50 pfg. Weimar 1886.

DAS ARBEITEN MIT GELATINE-EMULSIONSPLATTEN. Gesammelte Erfahrungen der Neuzeit aus der photographischen Praxis, mitgetheilt von J. F. Schmid. Wien 1887, Selbstverlag. 1 fl. 50 kr.

ANLEITUNG ZUM PHOTOGRAPHIREN MIT TROCKENPLATTEN für Dilettanten, Gelehrte und Künstler von J. F. Schippang & Co. (Inhaber E. Martini) Berlin. 3 verbesserte Auflage.

DIE AUGENBLICKSPHOTOGRAPHIE, IHR WESEN, IHRE BEDEUTUNG, IHRE ZIELE, dargestellt in Aufsätzen von Prof. Dr. Josef Maria Eder, Otto von Leixner, Dr. Karl Müllenhoff, Dr. Conrad Müller, Ludwig Pietsch, Dr. Adolf Rosenberg, Dr. F. Stolze, Prof. Dr. H. W. Vogel, Herm. Vogt. Herausgegeben von Ottomar Anschütz, Lissa (Posen). Gratisausgabe.

ANLEITUNG ZUR PHOTOGRAPHIE FÜR ANFÄNGER. Herausgegeben von G. Pizzighelli, k. k. Hauptmann der Genie-Waffe. Mit 70 Holzschnitten. Halle a. S., Verlag von W. Knopp.

JAHRBUCH FÜR PHOTOGRAPHIE UND REPRODUCTIONSKUNST FÜR DAS JAHR 1887. Editor, Dr. Jos. M. Eder. Halle a. S. Wilhelm Knapp.

DAS LICHT IM DIENSTE WISSENSCHAFTLICH FORSCHUNG. Sig. Theodor Stein. Band I, Heft 5. Die Photogrammetrie (Ed. by Dr. F. Stolze). Militärphotographie und optische projectionskunst. 170 illus., 8vo, 4m. Halle a. S. Wilhelm Knapp.

DIE PHOTOGRAPHIE, IHRE GESCHICHTE UND ENTWICKLUNG. Von W. Schmidt, Apotheker. (Sammlung gemeinverständlicher Vorträge.) Berin, bei Habel.

BETRIEB DER GALVANOPLASTIK ZU ZWECKEN GRAPHISCHER KUNSTE MIT DYNAMOELEKTRISCHER MASCHINE. Von Ottomar Volkmer, k. k. Regierungsrath und Oberstlieutenant in Reserve. (Separatabdruck aus. "Streffleur's österr. militär. Zeitschrift.") Wien, im Selbstverlage.

ANLEITUNG ZUR AUSFÜHRUNG MICROPHOTOGRAPHISCHER ARBEITEN. Bearbeitet und Herausgegeben von M. Stenglein und Schultz-Hencke, 131 S. Mit Abbildg. und 2 Lichtdrucktafeln. 8 Berlin. Rob. Oppenheim.

PRACTISCHE ANLEITUNG ZUM PHOTOGRAPHIREN BEI MAGNESIUMLICHT. Von J. Gädicke und A. Miethe. 34 S. Mit 2 Lichtdr. Berlin, Rob. Oppenheim.

DIE PHOTOGRAPHISCHEN APPARATE UND DIE PHOTOGRAPHISCHEN PROCESSE, dargestellt für Amateure und Touristen. G. Pizzighelli. Halle a. S. W. Knapp.

DIE MOMENTPHOTOGRAPHIE IN IHRER ANWENDUNG AUF KUNST UND WISSENSCHAFT. Dr. J. M. Eder. 2nd Ed. 24m. Halle a. S. W. Knapp.

HANDBUCH DER PHOTOGRAPHIE FUR AMATEURE UND TOURISTEN. G. Pizzighelli. 2 vols. Halle a. S. W. Knapp.

RATHGEBER FUR DEN POSITIVPROCESS AUF ALBUMINPAPIER. Dr. E. A. Just, Editor and Publisher. Vienna.

PRACTISCHE ANLEITUNG ZUR HIMMELSPHOTOGRAPHIE NEBST EINER KURZ GEFASSTEN ANLEITUNG ZUR MODERNEN PHOTOGRAPSCHIRHEN OPERATION in der Spectral analyse, 1887. Dr. Nicolaus von Konkaly. W. Knapp, Halle a S., publisher, DEO PHOTOCHEMIKER UND DIE HAUSINDUSTRIE. Mittheilungen ueber vorzuegliche methoden zum verziere von glass, porcellan, emaillierten waare, holtz, etc., 1887. Josef Laemling. W. Knapp, Halle a S., publisher.

FRENCH.

AIDE MEMOIRE DE PHOTOGRAPHIE. Pour 1887. C. Fabre. 12th year. Paris: Gauthier Villars.

NOTICE SUR LA CUVETTE-LABORATOIRE pour développer et fixer les clichés au gélatino-bromure d'argent sans laboratoire special et en pleine lumière. Par G. Bourgougnon.

NOTE SUR L'APPLICATION DE LA PHOTOGRAPHIE AUX MESURES MICROMETRIQUES DES ETOILES. T. N. Thiele. Gauthier Villars. Paris.

LA PHOTOGRAPHIE ASTRONOMIQUE A L'OBSERVATOIRE DE PARIS ET LA CART DU CIEL. E. Mouchez. Paris: Gauthier Villars.

LA PHOTOGRAPHIE, exposé de cet art et des phénomènes photo-chimiques qui lui servent de base. Le Major Haunat. Bibliotheque Gilon, Verviers.

MANUEL PRATIQUE DE PHOTOGRAPHIE INSTANTANÉE. A. Agle. Paris: Gauthier Villars.

NOTES SUR L'HISTOIRE DE LA PHOTOGRAPHIE ASTRONOMIQUE. G. Rayet, Bordeaux.

NOVEAUX PROCÉDÉS DE REPRODUCTIONS INDUSTRIELLES. A. Fisch. Paris: J. Michelet.

RAPPORT DU JURY DE LA CLASSE X A L'EXPOSITION INT. DES SCIENCES ET DES ARTS INDUSTRIELS. Ed. L. Vidal. Paris.

LA PHOTOGRAPHIE. M. Gossin.

LA PHOTOGRAHIE DES OBJETS, COLORÉS AVEC LEURS VALEURS NATURELLES. Dr. H. W. Vogel; tr. by Henry Gauthier Villars. Paris: Gauthier Villars.

LA PHOTOGRAPHIE SANS OBJECTIF. R. Colson. Paris: Gauthier Villars.

AIDE MEMOIREDE PHOTOGRAPHIE POUR 1887. Douzieme Année. C. Fabre. Paris. Gauthier Villars.

CARNET DU PHOTOGRAPH-AMATEUR A L'USAGE DES VOYAGEURS ET DES TOURISTS. Charles Jacob. Pour l' Anée, 1887. Paris. J. Michelet, editeur.

TRAITÉ PRATIQUE DE PHOTOGRAPHIE APPLIQUÉE AU DESSEN INDUSTRIEL. Par M. Amedée. Masselin, ingenieur. Chauny.

TRAITÉ PRATIQUE DE PHOTOMINIATURE. E. Blin. Paris. Michelet.

PRINTED FROM AN AMERICAN FILM NEGATIVE ON EASTMAN'S PERMANENT BROMIDE PAPER.

A NOOK ON IRONDEQUOIT BAY.

THE

AMERICAN ANNUAL OF PHOTOGRAPHY,

AND

PHOTOGRAPHIC TIMES ALMANAC.

REVIEW OF THE YEAR.

Once more we have to record a year of continuous progress, presenting no violent revolutions in practical methods, but rather a tendency toward simplifying those already in vogue. The use of the gelatine dry-plate has rapidly extended, and for all work in studio and field, everywhere save in process work, where black and white negatives are required, with perfectly clear glass for the shadows, may be said to be universal. Paper negatives are but little used, having been supplanted in popularity by the "American films," which consist of a film of insoluble sensitive gelatine emulsion attached to a paper support by means of a layer of soluble plain gelatine. The paper serves as a temporary support during the operations of exposure, developing, fixing, and washing, after which the film is laid down on a prepared sheet of glass, the paper is removed by warm water which dissolves the soluble gelatine layer and leaves the film on the glass; the paper is then replaced by a "skin" of gelatine and the whole stripped from the glass ready for printing.

This process gives a clear, transparent, flexible negative, of superior printing quality, having all the advantages of glass and neither its weight nor its fragility.

The films are prepared for use singly, or in the roll-holder, and the sensitiveness runs from 18 to 22 Warnerke.

As was well said by the author of a paper read before one of the English societies, there are two great lines on which photography is advancing to-day; as a means of acquiring scientific fact, and as a means of reproducing works of art. The first application has been most evident in the service of astronomy in its various branches. At Harvard College the Draper Fund has been devoted to the study of stellar spectra. In Europe the work of mapping the stars by aid of photography has been planned, the task divided among a number of observatories situated in different parts of the world, and objectives of similar qualities are in process of construction for the use of these observatories, so that the conditions may be the same. It is estimated that ten years will be required to complete the undertaking. An International Astro-photographic Congress was held in Paris, April 16th, mainly for the purpose of settling on this work.

The object-glasses of the great Lick telescope have been safely transported to their destination, but there have been no accounts of their testing or use.

Microscopic work has also been diligently prosecuted, the new apochromatic objectives having been of advantage.

The various reproduction methods have gone on increasing in use and perfectness. The Goupil photo-gravure still holds first place for reproduction of paintings, etc., but is closely followed by others in this country, and is, perhaps, excelled by the excellent work of Edwards, in so far as landscape and other direct work is concerned.

Newspaper cuts hardly come under the head of art, but at the same time, their production by the aid of photography is one of the signs of the times. No description of localities is now considered complete, unless accompanied by a cut of some sort, from a photograph. Portraits are not, as a rule, successful, owing partly to the necessity for printing them on the cylindrical form.

The interest in isochromatic work has been maintained, but no special advances can be recorded in practice.

The theory of this, as well as other processes, has had a most valuable contribution in the papers on the photo-chemistry of the silver haloids, by M. Carey Lea, of Philadelphia, which treat exhaustively of the different salts involved in negative making by the usual processes, their production and properties under different conditions. In time these investigations will doubtless mark an era in the history of color photography, though their practical bearings are not at present wholly clear, but their value is admitted on all sides.

The ever-recurring claim of the discovery of a process of photography in natural colors has been made quite the usual number of times; more particularly in England, where two different concerns advertised their readiness to undertake the feat, but finally proved to produce only deftly painted positives.

A compilation has been made giving the relative composition of the developers recommended by leading dry-plate makers for their plates. This was interesting as indicating the various proportions in vogue, but this was mainly useful to show that the matter of constitution of the developer is one of little moment; brains being the most essential ingredient. From two to twenty grains of pyro to the ounce is a large range for variation for plates presumably of similar constitution.

The matter of percentage solutions has occupied much attention in England. This result is to be attained with sufficient accuracy by taking, say, an ounce by weight of a chemical, dissolving in a few ounces, by measure, of water, and afterward making up to ten ounces by measure. Every ounce of this solution will contain then one-tenth ounce of the salt.

Mr. W. Jerome Harrison has rendered a service to all photographic workers by his researches in the bibliography of photography, begun in 1886, and continued during part of this year. His lists cover only printed books published in England. It is to be hoped that similar work may be done for French, German, and other European tongues.

Photography by artificial light has taken an important step. An apparatus has been arranged and a pamphlet published by Gaedike & Miethe, of Berlin, in which a mixture of magnesium with other ingredients is used for the flash. Dr. Piffard, of New York, uses powdered magnesium ignited by means of gun cotton, and put in the shape of a cartridge in an ordinary pistol of large bore, and has produced some very good results.

The exhibitions of the year have been numerous and beneficial. The combined exhibition of New York, Boston, and Philadelphia Societies, held in New York in March, was largely attended and successful. That in connection with the Chicago Convention was extensive and instructive.

The necrology is rather extensive and includes the following names of more or less well-known workers:

In Europe—Major Russell; C. Quidde, December 15, 1886, at Berlin, Secretary of Society for Cultivation of Photography; J. B. Obernetter, died April 13th, in Munich, aged 46; he was educated a chemist, then studied photography under Albert; Leonce Rommelaère, founder of the Association Belge, died March 18th, aged 57.

In America—L. C. Mundy, December 19, 1886, well-known photographer of Central New York; J. H. Pugh, January 22d, Macon, Ga.; C. C. Wright, Denver, Col., January 27th; E. H. Derham, Jas. E. McClees, one of the earliest workers in this country; the first after Langenheim & Whipple to make paper photographs; D. A. Clifford, St. Johnsbury, Vt.; Edw. F. Hartley, Chicago, October 9th.

THE EDITOR.

FOCAL ADJUSTMENT IN DETECTIVE CAMERAS.

In last year's Annual the relations of the two conjugate foci of a lens to its equivalent focus were shown to be such that *the reciprocal of the latter is always equal to the sum of the reciprocals of the two former.* The general equation stands:

$$\frac{1}{D}+\frac{1}{d}=\frac{1}{f},$$

where D is the distance of the object from the optical center of the lens, d the distance of the image on the ground glass from the same optical center, and f the equivalent focus of the lens.

This formula is a fundamental one; it lies at the basis of all optical calculation; its use, for example, in forming tables of enlargement and reduction is given in the appendices of nearly all the photographic annuals; and from it was derived by the present writer a very easy and practical method of managing the copying camera. (See *Photographic Times* of December 3d, 1886).

It is now proposed to show how convenient this equation may be found in adjusting the focus of detective cameras for different distances of objects. The algebraical work need not frighten any one; it is purposely made of the simplest and most elementary character.

Our equation, then, in words is:

$$\frac{1}{\text{Distance of object.}}+\frac{1}{\text{Distance of ground glass.}}=\frac{1}{\text{Equivalent focus.}}$$

Or, in algebraical notation,

$$\frac{1}{D}+\frac{1}{d}=\frac{1}{f}\text{..........................}(1).$$

Now it is evident that d, the distance of the ground glass from the center of our lens, is smallest when D, the distance of the object, is so great that the rays come from the object *parallel* (for then D becomes practically an infinite distance, the expression $\frac{1}{D}$ disappears, and the equation becomes $d=f$).

It is also evident that the ground glass must be moved more and more *away* from the lens, as the object approaches nearer and nearer to the camera.

For any near object, therefore, the ground glass must always be *drawn away* from the lens a distance equal to its focal length *and something more.*

As d will always equal f, *with something over*, and as in our present inquiry what we wish to find is precisely that "something over" (*i. e.*, every successive increment of d corresponding to the varying distances of D), we may represent d by $f + x$; *i. e.*, the equivalent focus *plus* the required increment. Equation (1) then reads

$$\frac{1}{D} + \frac{1}{f+x} = \frac{1}{f} \ldots\ldots\ldots\ldots\ldots\ldots (2).$$

Multiplying by Df, we have

$$f + \frac{Df}{f+x} = D \ldots\ldots\ldots\ldots\ldots\ldots (3).$$

Clearing of fractions gives us

$$f^2 + fx + Df = Df + Dx \ldots\ldots\ldots\ldots\ldots (4).$$

Eliminating Df from both sides, equation (4) becomes

$$f^2 = (D - f)\,x,$$

or, what is the same thing,

$$\frac{D-f}{f} = \frac{f}{x} \ldots\ldots\ldots\ldots\ldots\ldots (5).$$

Stating equation (5) in the form of a proportion, we have

$$D - f : f :: f : x.$$

Or, in words,—As the distance of the object (measured from a point one focal length in front of the center of the lens), is to the equivalent focus, so is the equivalent focus to the required "something over." The equivalent focus of our lens is, therefore, *a mean proportional between the distance of the object (less one focal length), and the distance through which we must move the ground glass away from the principal focus in order to bring the said object into exact focus.*

When the object is no nearer than twenty feet, with lenses of ordinary focal length, f is so small a quantity in comparison with D, that it may be neglected; and the proportion reads

$$D : f :: f : x.$$

Now, to apply this to detective cameras: Suppose my lens is fifteen inches focus. How much further away from fifteen inches must I move the ground glass to make a sharp image of an object 100 feet (1,200 inches) distant?

$$1{,}200 : 15 :: 15 : \tfrac{3}{16}.$$

Ans. Three-sixteenths of an inch beyond the equivalent focus mark.

Suppose the object is twenty feet (240 inches) away, and the lens is six inches focus:

$$240 : 6 :: 6 : \tfrac{3}{20}.$$

Ans. Three-twentieths of an inch beyond the equivalent focus mark. And similarly for objects at any distance, and for lenses of any focal length.

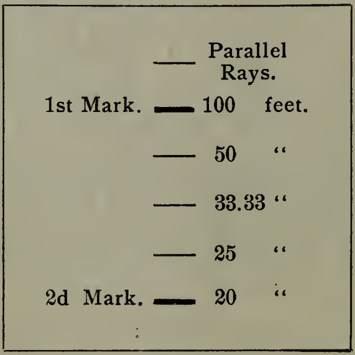
For the convenience of amateurs who may not know the precise focus of the lens they use, the following method may prove of service. It is derived from the foregoing calculations, and may be relied upon as accurate.

1st. Focus on an object 100 feet away; mark this point on the camera bed.

2d. Focus and mark similarly for an object twenty feet away.

3d. Divide the space between these two marks into four parts, and make the three intermediate marks to denote the intervals. These will represent the proper foci for objects distant 50, 33.33, and 25 feet, respectively.

4th. Make an additional mark inside of the 100-feet mark (*i. e.*, *nearer* the lens), at a distance equal to one of the intervals of the foregoing scale. This will be the focus of parallel rays, or the *equivalent focus* of the lens. The accompanying figure will make this quite clear:



Should anyone wish to "draw a bead" on objects nearer than twenty feet, these marks may be continued at the same intervals *ad libitum.* Fifteen more such marks, for example, continued at equal intervals beyond the twenty-foot mark, would represent the proper foci for objects distant, respectively, 16.67, 14.29, 12.50, 11.11, 10, 9.09, 8.33, 7.69, 7.14, 6.67, 6.25, 5.88, 5.55, 5.26 and 5 feet.

Clarence E. Woodman, Ph.D.

New York.

ON THE PREPARATION OF PHOTOGRAPHIC GUN COTTON.

A good photographic gun cotton perfectly soluble in ether-alcohol, and when dissolved flowing evenly over the plate, can only be made with a good nitrifying mixture. I use successfully the following method which, out of probably fifty differently proportioned compounds, has never failed to produce the best results. The cotton used should be perfectly white and free from greasy matter (surgeons' cotton without carbolic acid); the sulphuric acid must be chemically pure and of 66 deg. Beaumé spec. gravity.

The nitrifying mixture, consisting of

Finely pulverized nitrate of potassium	500 grams.
Sulphuric acid	1000 c. c. m. (1 liter).
Water	30 c. c. m.

compounded in a tolerably deep porcelain dish, is thoroughly stirred with a glass rod until all the lumps formed are well divided, the mixture presenting an even and uniform mass. With the addition of the sulphuric acid, temperature rises to from 60 deg. to 64 deg. Celsius, when the cotton, in small portions of from thirty to forty grams, is to be quickly introduced by an assistant who plunges each individual portion of cotton into the mixture, turning and kneading it continuously with the glass rods. Especial care should be taken to allow no particles of cotton to remain above the surface of the acid for any length of time, keeping it constantly submerged.

After ten minutes' nitrifying, the process is completed. The cotton fiber should not be destroyed by the operation; neither should its natural tenacity remain quite intact.

By means of glass rods, the cotton is finally removed to a capacious vessel containing plenty of water, and washed over night, either in repeated changes or a continuous stream of water, pressed between blotting paper and dried spontaneously in the air. As a rule, forty grams of cotton will yield fifty grams of gun-cotton.

If pyroxyline is to be preserved for a long time, it is best kept submerged in water. To add soda or ammonia to the wash-water may increase the keeping quality of dry pyroxyline, but it is done with the sacrifice of its fine white appearance, alkalies giving invariably to pyroxyline a decided yellowish color. A beautiful snow-white color can be attained by immersing the pyroxyline in a filtered solution of a little chloride of lime in diluted hydrochloride acid. This solution, of a strong chlorine odor, when diluted with water bleaches the wool in a few seconds without deterioration of its good photographic qualities.

I employ, however, only rarely the process of bleaching. Very interesting is the fact that gun cotton, when submerged in water and exposed to diffused daylight (near a window) in a few weeks of exposure loses its yellow color, which gives place to a perfect white.

Pyroxyline prepared by the above method dissolves readily in ether-alcohol, without any residue, and gives a good photographic collodion.

Dr. Jos. M. Eder.

VIENNA.

THE ORIGIN OF BLISTERS IN ALBUMEN PRINTS.

It is well-known to most photographers, doubtless, that blisters in albumen prints are filled with gas. To any one of the thousands who have been annoyed by them times without number, who has cared to know to what family of substances their contents belong, nothing could be easier to learn than this fact; to demonstrate which it is only necessary to prick one or any number of them and press out their contents under water. The bubbles which escape and rise to the surface prove that they were filled with some kind of gas. The fact that carbonic acid gas is what they contain, though not generally known, was not new to some of those who read its announcement in a late number of the *Photographic Times*,* in which the discovery was credited to Dr. Just. Who was the first to learn this important fact is of less consequence than to know how and why this gas happens to be in the print.

The right answer to this question involves, if I am not mistaken, a new theory of the origin of blisters which I will present and endeavor to substantiate by adequate proofs.

My theory is that blisters in albumen prints are caused by gas which is generated in the prints by the action of the hypo bath.

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* October 14, 1887.

Having first proved beyond question that carbonic acid gas was the agent actively concerned in causing the mischief, the questions of its source next presented itself. Was it from the water? The water which I have used almost exclusively in connection with this investigation has been from Lake Michigan, which has always proved to be admirably adapted to the production of blisters as well as an excellent medium in which to acquire the art of successfully avoiding them. It seems impossible that this water can hold a sufficient quantity of this gas to account for the effects produced. Even if it were charged with as much as it could possibly retain, how or by what means is it made to enter the paper with sufficient force to split the albumen film from the paper? Let any one attempt to separate these two in the same manner as it is performed by the gas, and he will undoubtedly be convinced that no such forcible entrance is made from outside of the paper. Take for example a large blister an inch across, not more than a quarter of an inch from the edge and almost as near to the corner of the print. One such I had only a few days ago—a distended gas-bag that bent the whole corner of the print out of shape. Can any one believe that gas from the water pushed itself like the seven devils we read of, into the corner of this print instead of quietly lifting the paper a little and "silently" slipping out from under? The print was face down on the top of the water where it had lain over night. To suppose the one would be to suppose a miracle, while the other would be the easiest and most natural thing in the world for it to do.

But, again, if gas contained in the water causes the blisters, it will be just as liable to do it before fixing as during or following it. To test this I had prints washed and made ready for toning and then left in water all the way from two to forty-eight hours without ever the sign of a blister. This I have repeated so many times with the same impunity that I would be willing to recommend a gold medal to the photographer who will exhibit the best single blister produced either in lake, spring, or soda water in a print before fixing; time of soaking not to exceed one week. Neither have I seen (in recent years) any blisters in the toning bath or in the water in which the prints have lain toned and unfixed over night.

We come now to the hypo bath, the exclusive birthplace, as I claim, of the evil under consideration. By this I mean that the gas which causes the mischief is generated (in greater or less quantity) in this bath, and that, too, whether the blisters make their appearance or not. Conditions may exist, or may be made, which prevent the forming of the sacs while the gas escapes in minute bubbles through the pores of the paper. Under the observance of suitable precautions the prints usually pass through the requisite washing without injury. Generally the hypo bath is of sufficient density to prevent their forming while the prints are immersed in it, but as is well known, in rare instances they do appear, in half shot-like form, while the fixing is in progress. This may be considered the premonitory symptom of an aggravated case, requiring vigorous measures to save the prints. The surest way of doing this, is, as has been said, to remove them from the water as soon as possible, and let them dry; after which they may be safely washed. Every printer knows how hard these small blisters are, and how likely they are to become confluent and thereby greatly enlarged if preventive measures are not taken. Is it not almost certain that the gas which so forcibly distends them, is generated within the prints where this action takes place?

In further proof of this conclusion I will describe one experiment among many that were tried with the view of settling this point:

Upon an unfixed print of sufficient size I inverted a glass funnel, and gathered the print up closely around it, firmly securing it (the print) at the neck with a string. Supporting the contrivance on the bottom of a large evaporating dish, I nearly filled the funnel through the neck with hypo solution, and then the dish outside the funnel with water. The funnel and contents were then raised and supported a little above the bottom of the dish. Here in effect was a paper bag made of an albumen print, filled with hypo bath and suspended in water, the funnel serving only to keep it in shape while the hypo solution had free access to the inside surface of the print throughout nearly its whole extent. Observe now what follows: Very soon numberless minute bubbles of gas began to rise from the outside of the print, and continued until the surface of the water around the neck of the funnel was flecked with miniature foam. In due time all was quiet again, but to me there was no longer a doubt that the gas was generated in the print by the action of the fixing bath, and further that the same thing invariably takes place when prints on albumen paper are fixed. The greater the quantity of albumen on the paper, the greater probably is the quantity of gas evolved, and consequently the greater the liability to blister. This gives rise to the suspicion that some organic compound is formed under the printed surface, which is decomposed by the hypo, and that this gas is one of the products of the decomposition.

Let us see if we can find an analogous case which may serve to justify such a conjecture. First, the strong tendency of certain organic substances to oxidation and decay resulting in the evolution of the same gas that we are considering is a well-established fact. Secondly, albumen is one of the most unstable organic substances known. Doubtless oxidation to some extent takes place in this substance before and during printing, and we may therefore suppose, in view of the phenomena before mentioned, that the hypo completes the decomposition of that portion so affected. To further strengthen this supposition, I will cite one more experiment: A dried ox-bladder, another example of perishable organic matter, first soaked in water to render it pliable, was substitued in place of the print, as used in the former experiment. The same phenomenon of escaping gas ensued as was witnessed in the other case. Is it not probable then that the hypo decomposes the oxidized portion of organic matter, accomplishing at once what the slower process of decay no less surely accomplishes in the laboratory of nature? If this be the true explanation, it is not difficult to account for the greater or less liability to blister under various conditions which has often been noticed. Prints, for example, are more apt to blister in summer than in winter. The most highly albumenized papers are more liable than those of lower grades. A very strong silver-bath, highly charged with organic matter which it holds in solution, sometimes creates such a strong tendency to blister that it is almost impossible to save the prints. By diluting the solution to a strength still sufficient for vigorous prints, and sunning it, the trouble disappears as if touched with the wand of an exorcist. The organic matter held in solution by the nitrate of silver, and with it carried into the paper, was probably already oxidized, thereby increasing the quantity of matter to be decomposed by the hypo.

Of course, no one will accept any more of what is here merely conjectured than he sees good reasons for believing. But it seems to me that the evidences that I have presented, that the gas which causes the blisters in albumen prints is generated in them by the decomposition of oxidized organic matter through the action of the fixing solution, are of sufficient weight to establish a presumption, at least, that the explanation is substantially true.

W. H. Sherman.

MILWAUKEE, WIS.

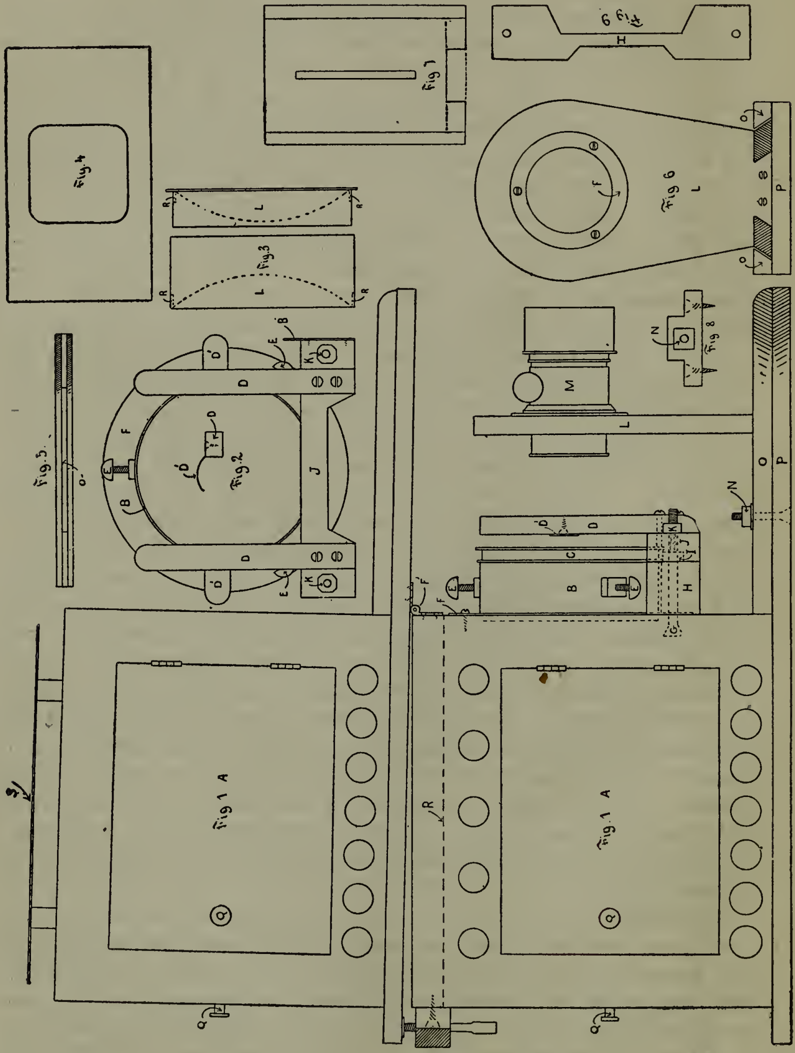
Fig.4
Fig 7
Fig 9
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Fig 8
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Fig 1 A
Fig.1 A
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DIAGRAM 1.

A HOME-MADE STEREOPTICON OUTFIT.

Wishing to be the possessor of a pair of oxyhydrogen dissolving view lanterns, I determined to try and build a pair myself. Desiring to make the apparatus as light as possible, I selected one-half inch whitewood for the work, making the lantern bodies 9x9x11 inches (outside measurement), with hinged doors in the sides and backs.

The bottom board of each projects nine and a half inches beyond the front of lantern body; upon this are screwed two beveled strips of wood which serve as guides for the objective holders. (See diagram, Figs. 6 and 7.)

In the fronts of each body I sawed circular holes five inches in diameter for the condensers, the edge of each being three inches above the bottom board.

In the sides of each body near the base I bored seven holes, in order to admit of a free circulation of air, which does much to prevent the lanterns becoming overheated; in the top of the lower lantern body are ten holes, five on each side.

Having made the bodies, I next lined them with sheet zinc, and also made of Russia iron, two flanges, to which were fastened collars of same metal one and a half inches deep; upon the outside of each were soldered three nuts in which work small thumb-screws.

The flanges are fastened to the lantern body with three round-headed screws.

The condensers are four and a half inches in diameter and were mounted by a tinsmith so they can be easily slipped apart when necessary. They fit loosely in the collars and can be fastened in place by a turn or two of the thumb-screws.

I made my slide-holders from several cigar boxes; they are 7x4 inches, with openings a trifle smaller than the usual size lantern mat.

This enables me to project pictures of uniform size and shape upon the screen, no matter how many different makers' slides are used.

The holders are kept in place by pieces of an old clock-spring fastened to two upright pieces of wood just in front of and a little at the sides of condensers.

The method of fastening these pieces is shown in Fig. 1, D.

When using the lanterns, the slides are dropped into the top holder of the upper lantern, and pushed in at the side of the holder in the lower one; this enables me to work upon one side of the apparatus.

My jets are the "mixed" kind and were purchased in New

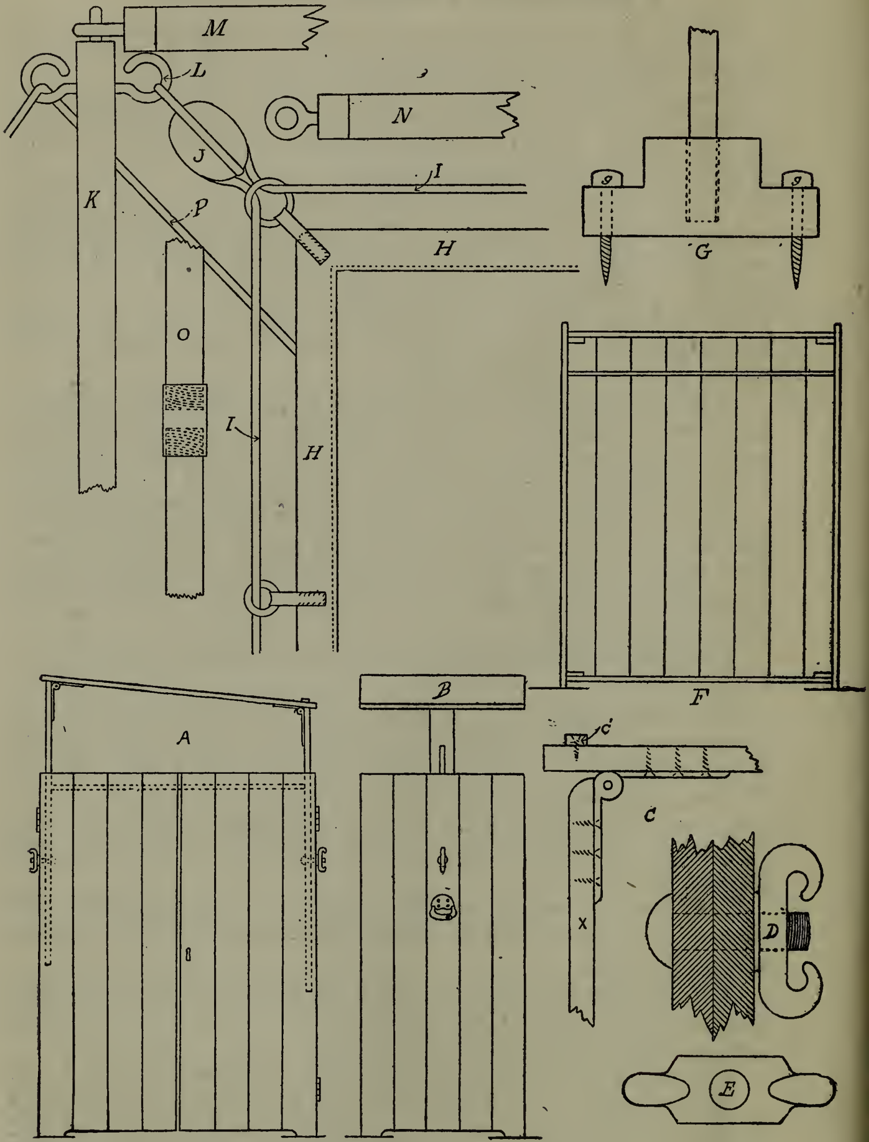

DIAGRAM 2.

York; they are mounted upon wooden bases and slide freely between guides of wood screwed to the bottom boards.

I can fasten them at any point by turning down a nut upon a small washer and tire-bolt that passes through the bottom of lantern and base of jet.

It was my intention at first to use the lanterns side by side, but finding they took up too much room decided to place one above the other.

In order to make the picture projected by each to occupy the same place upon the screen, I fastened them together by means of two brass hinges which are screwed to the front of the lower lantern and to the bottom board of the upper one, and at the back of the lower lantern (near the top), I fastened a two and a half inch tire-bolt, and after filing the head square found that a few turns will depress the front sufficiently to produce the desired effect upon the screen. After using them in this way I found the heat generated in the lower, overheated the upper lantern body; the addition of a strip of wood an inch wide upon the upper edge remedied this.

The box which answers for transporting the lanterns from place to place has two tops, the upper being movable; upon the under side of this at the front and back are fastened large strap-hinges, screwed to these are pieces of oak wood two and three-quarter inches wide, three-quarter inch thick and twenty-six inches long (these pieces slide through holes cut for them in the second top), a narrow slot being sawed out of each to within a few inches of the ends.

Through these slots and the sides of the box are two bolts and thumb-nuts, so placed that they can be turned from the outside.

By means of these, the movable top can be fastened at any angle, the space underneath serving splendidly as a stand for the views. Upon the movable top, near the edge, is fastened a narrow strip of wood to prevent lanterns from slipping.

Size of box is 29x13½x23 inches (inside measurement).

I next procured for a twelve-foot screen eight yards of bleached sheeting, two yards wide; cutting this in half made two pieces twelve feet long; these were sewn together, and an inch hem made entirely around.

Next I purchased four dozen iron rings; forty-four were three-quarter-inch in diameter and four one inch in diameter; the larger ones were sewn fast to the corners of the screen with strong tape, and the others sewed in the same way around the four sides a foot apart.

Next came something to hang my screen on.

Finding some galvanized iron pipe about seven-eighths inch in diameter, I had it cut into four lengths, each six feet six inches, with couplings upon two ends and threads cut to match upon the others; when screwed together, they make two pieces thirteen feet long, each having a double-hook at the ends forming the top. I next made two oak blocks 9x2½x2½ inches, with a hole in the center of each large enough to admit the end of the pipe; at the ends were smaller holes to pass a two and one-half inch carriage screw through to fasten them to the floor to keep the pipes apart at the bottom when the screen is up.

My next purchase consisted of three small pulleys and a lot of clothes-line; about fifty feet of this was passed through the large ring at the lower left corner of the screen, thence through the other rings upon that side, then through one of the pulleys and back through the ring at the upper left-hand corner; then through the top rings and pulley at the upper right-hand corner, down to another pulley at the lower right-hand corner; then through the bottom rings to the starting point. The screen was then ready to be put up at any time.

To do this the oak blocks are screwed fast to the floor, pipes screwed together, stay ropes passed through the double-hooks upon the upper ends of the pipes, upper pulleys fastened to them also, pipes and screen raised, ends of pipes put in blocks and made rigid by means of the stay ropes being tied to screw eyes in the floor. Tie end of left-hand rope to a screw eye at base of left-hand pipe, fasten lower right-hand pulley in same way at base of right-hand pipe, and pull upon rope passing through bottom rings (this will make the screen perfectly smooth); then tie end of rope to screw-hook at the left.

Lately I have added to the frame several jointed pieces of curtain roller; these, when fastened to the tops of the side pipes, make them much stronger.

I have other pieces of pipe that will lengthen the side pipes to sixteen feet, which answer for a fifteen-foot screen; these and the pieces of curtain roller, pack in a box five inches wide, five inches high, and six feet seven inches long (interior measurement).

Two screens, twelve and fifteen feet square, pack in the box with the lanterns; also the high-pressure dissolver, tubing, limes, wrench, etc., etc.

My views are enclosed in another box, 9x11½x4½ inches (inside measurement), so my entire outfit is contained in three boxes, and is in some respects superior to any that I could purchase.

I use the gases compressed in cylinders, and find they give little or no trouble, and are so much more convenient than bags that I would not think of ever using the latter.

I order the cylinders from New York, and find the expense trifling when compared with the trouble of making and storing the gases in bags.

A. H. Oakes.

KATONAH, N. Y.

EXPLANATION OF FIRST DIAGRAM.

FIGURE 1.

A Bodies of Lanterns.
B Russia Iron Collars.
C Condenser slightly drawn forward.
D Upright pieces fastened to J by screws.
D′ Clock spring.
E Thumb-screws and nuts on collar.
F Flange fastened to front of lantern.
F′ Hinge.
G Tire-bolt passing through lantern body H and J.
I Nut fastening H to lantern body.
K Nut upon outside of J which can be taken off when necessary to remove condensers.
L Objective holder, L′ lens.
M Objective (ordinary quarter-size lantern).
N Nut and tire-bolt passing through slot in base of objective holder and bottom board of lantern ; a turn of nut will fasten the objective holder at any point.
O Beveled strips upon bottom board P.
P Bottom board.
Q Knobs on doors.
R Dotted lines representing Russia iron top on lower lantern.
S Russia iron top to upper lantern. The opening underneath is an inch smaller than this top, thus preventing an escape of much light.

FIG. 2. Parts corresponding to those of Fig. 1 marked the same. Condenser has been removed in this figure.
B′ Stop for slide holder.

FIG. 3. Condensers slightly separated. Dotted lines represent lenses L L. Lenses are held in place by circular rings of spring brass.
R rings.

FIG. 4. Slide-holder.

FIG. 5. Same with opening for slide O.

FIG. 6. Parts correspond to those of Fig. 1.
F flange of objective.

FIG. 7. Base of objective holder with slot and beveled egdes. Dotted lines represent lens holder.

FIG. 8. Piece of wood screwed to upper part of bottom lantern.
N Nut sunken into wood through which passes a 2½ inch tire-bolt. A few turns of this will depress or raise front of top lantern.

FIG. 9. Shape of piece H, Fig. 1, upper edge next Fig. 6. This and the piece J, Fig. 1, are made of wood.

The parts shown in diagram of lower lantern should also be applied in the construction of the upper one.

EXPLANATION OF SECOND DIAGRAM.

A	Front of box with top raised.
B	Back of box with top raised.
C	Detail of top, strap-hinge and piece marked X, which slides through top of box.
C′	Strip to prevent lanterns from slipping.
D	Thumb-nut, washer and bolt to fasten movable top.
E	Thumb-nut.
F	Interior of box with cleats at corners and shelf near top. Doors are removed.
G	Piece of oak wood to keep screen pipes apart.
g g	Carriage screws.
H	Screen and rings.
I	Rope passing through rings and around pulley J.
K	Galvanized iron pipe.
L	Double hook near top of pipe.
M	Curtain roller with screw eye to keep pipes apart at the top.
N	Same as above.
O	Pipe and coupling.

EXPERIMENTS WITH ORTHOCHROMATIC PLATES.

The greater number of formulæ for rendering plates *orthochromatic* recommend the immersion of gelatino-bromide plates in a bath of coloring matter (cyanine, tetrabromfluorescein, tetrasodfluorescein, erythrosine, rose bengal, chrysaniline, Hoffman's violet, etc.), while others indicate that the coloring matter should be added directly to the emulsion at the moment of coating it on the glasses.

Without occupying myself with the question, whether this or that substance is the better for rendering plates orthochromatic, I shall only consider the results obtained in treating the plates by both methods.

The bath method would certainly recommend itself as the most convenient, since one can render the plates "ortho" at the moment they are needed; this method gives, even with certain coloring matters, better results than the other, but, unfortunately, these results are not sure. It might happen, for instance, that a bath formula would succeed several times, and then afterwards give only foggy plates. If the plates which are made color-sensitive are only slightly sensitive, the fog appears more rarely; yet, when highly sensitive plates are thus treated, it seldom happens that they are obtained absolutely clear. Moreover, plates thus prepared usually deteriorate in a very short time, the edges blacken, and the fog extends towards the center of the plate in proportion to the length of time they are kept.

Desiring to ascertain whether or no these black edges proceeded from the packing, I prepared with the same emulsion:

A.—Ordinary plates.

B.—"Ortho" plates by immersing ordinary plates in a bath.

C.—"Ortho" plates by adding the coloring matter to the emulsion and then coating on the glass.

Then the series of plates (A, B, and C) were packed together in perfectly dry black paper, and then placed in cardboard boxes.

At the end of fifteen days a comparative trial showed:

1st. None of the B and C series have lost their orthochromatic properties.

2d. The "ortho" plates, B, were slightly edged with black.

At the end of one month:

1st. None of the B and C series have lost their orthochromatic properties.

2d. The plates, B, were surrounded by a black edge of one centimeter.

3d. The plates, A and C, were absolutely clear and without black edge, as at commencement.

At the end of three months:

1st. The plates, B, were fogged; the black border had extended to about two and one-half centimeters from the edge.

2d. The plates, A and C, were in perfect preservation.

Wishing to satisfy myself whether this result was owing to the dye employed in this experiment, I prepared "ortho" plates by means of the two methods above indicated, with six of the best-known dyes, and have obtained the same result with all. At the end of a month all the plates treated by the bath process had a black border, and several were fogged, while all the others were perfectly good.

I believe, then, that one can only prepare durable "ortho" plates by adding the substance to the emulsion. I have plates thus prepared more than six months old which have lost none of their primary properties, and whose edges are not fogged.

In adding the dye to the emulsion, one must avoid using too much or too little; if too much, the general sensitiveness of the plates is diminished, and, if too little, the orthochromatic effect is hardly perceptible.

An excellent means for the photographer who possesses a "centrifugal separator," is to add the coloring matter to the emulsion before the separation of the Ag. Br., for thus all excess of color is strained off with the liquid, and only the exact necessary quantity of dye remains, combined with the argentic bromide.

The plates thus prepared are of remarkable purity, and their sensitiveness is undiminished.

GENEVA. *Ed. L. Boissonnas.*

MOUNTING SILVER PRINTS IN OPTICAL CONTACT WITH GLASS, AND ORNAMENTAL BORDERS.

Of late it has become the fashion for several of my amateur acquaintances here to mount their silver prints in optical contact with glass plates, and numerous inquiries are made for improved frames to support the various shaped glasses which are intended to bear the photographs.

For a long time narrow burnished metal rims have been procurable at the stock houses, but they lack the attractiveness of design and quality one might expect would be the first *desideratum* of the manufacturer. A better class of frame may, however, be available before these lines are in type, so my further remarks will bear on the practical details of the process, which, although in the main more than twenty years old, quite possibly some reader of the Annual may be unacquainted with the *modus operandi.* Perhaps it is needless to remark that the print to be operated upon is pressed in the wet state in contact with glass and dried; but in practice the condition of the glass surface is all important. It must have been scrupulously cleaned by one of the usual methods, such as tripoli powder, etc., or the print will ultimately leave its support wherever the glass is dirty; then the plates have to be warmed to a temperature of 100 deg. Fahr., and covered with a heated solution of gelatine.

The next point of importance is the character of the gelatine. Common glue answers better than the high-priced gelatines employed in dry-plate manufacture, but the substance used in house decorations named "patent size," works satisfactorily, provided the temperature is carefully regulated. The coating and drying-room should be free from dust, and an even temperature of 65 deg. Fahr. maintained; with these provisions success will be tolerably certain. The apparatus required is not extensive and consists of two rectangular tin dishes, one for dissolving gelatine and the other for soaking prints in liquid gelatine; an oven or gas stove to supply heat; a coating jug and the means for keeping it warm; a Wedgwood funnel with sponge—wool or paper—in neck for filtering; a piece of rubber sandwiched between strips of wood for scraping away excess of gelatine; laths to form drying racks; padded blocks of similar size to the metal rims used; and a burnishing tool to turn and flatten the metal rims.

Place enough "size" in small lumps to cover the bottom of one of the tin dishes, add cold water sufficient to submerge the "size," stand the dish on stove or oven until the gelatine is perfectly melted, which will be at a few degrees short of boiling point; filter, while hot, a portion into second dish, and the remainder into coating jug; the contents of both jug and dish must be kept hot. Place a few prints cut rather smaller than glass used in dish of liquified gelatine to soak. Next, a well-polished glass plate is heated to 100 deg. Fahr., leveled, and a pool of liquid from the jug poured upon the center and conducted over the surface with a glass rod if necessary. Then take a soaked print from the dish and lay, picture side down, on gelatinized glass. Pass scraper over back of print once or twice, then wipe off superfluous liquid with moist sponge; now squeegee freely with scraper, protecting print meanwhile by the interposition of a thin sheet of rubber cloth. Supposing there are no bright specks (air bells) visible on the other side, the plate may be laid photograph upwards, on the laths to dry, which, under favorable conditions, will occupy about two hours, but if there are bubbles, the squeegee must be applied more vigorously. A second coating of gelatine should then be given, and drying take place as before. This completes the process of mounting in optical contact with glass, and one photograph or several may be attached to the same sheet of glass, the interstices being filled with a black enamel margin, or some fanciful border may be added to enhance the effectiveness of the work. Thus the medallion to be seen in any fancy stationer's shop has a broad black band of glass surrounding the photograph, the whole being encased in a metal rim. This black margin is produced as follows: When the second coating of gelatine is quite dry, paint round the photograph with asphaltum varnish, completely covering the unprotected glass, but not overlapping the print more than is absolutely necessary. Half an hour afterwards the black varnish will be dry, and all that remains to be done is to put on the rim and back, and fix securely with the burnishing tool. Margins of gold or silver may be substituted for the black, in which case some assistance will be found in the use of a thick solution of "japanner's gold size" as a medium whereon to lay the leaves. Sprays of flowers or other artistic decorations can be painted in oil colors around the margin. Indeed, this method of mounting offers unlimited opportunities for the effective display of skill.

W. M. Ashman.

LONDON.

"IT'S NO JIST READY YET."

I AM often asked by some of my amateur friends to account for a lack of brilliancy in their pictures. They use the best instruments, plates, etc. Still, somehow or other, they fail in getting that pluck and sparkle so noticeable in the work of leading landscape artists.

Now I feel that among the great army of amateurs there exists much misconception in landscape work. Having made up their minds for a day's outing, or it may be a holiday of longer duration, they expose plate after plate just when they chance to see a nice little bit, or something that strikes them as worthy of an exposure; very likely it may be with tolerably good results, but still somehow their pictures want that something which they can not account for, and very likely the plates are blamed, or the paper won't print properly.

I well remember on one occasion at the Trossachs meeting an old friend who knew what he was about. He was going to expose a plate on that lovely scene "where twines the path," immortalized by Sir Walter Scott in "The Lady of the Lake." He was sitting by the roadside with a bit of oat-cake in one hand, and a drop of the "auld kirk" in the other, looking "unco happy."

"I hae been waitin' syne three year for this yin, and I'm thinkin' I'm gaun to git it noo." And then he added in his canny Scotch way: "But it's no jist ready yet."

I was so forcibly struck with this remark that I there and then decided to adopt it as my text for this year's ANNUAL.

Beginners may not be aware of it, but nevertheless it is the case that before they can hope to become good landscape workers they must study.

Now in this waiting till it's just ready lies the whole secret. My old friend had studied to depict the scene exactly as described "Where twines the path mid shadows hid, 'neath many a rocky pyramid."

An easy matter it was to photograph the path, but what about the path "mid shadows hid?" To do this he had to study; for many a day he had watched the shadows fall, he had noticed them in early morning, he had studied them at noon, until finally he had made up his mind when to expose; then he waited for a combination of bright sunshine and absolutely still foliage and clear atmosphere, so as to depict the rocky pyramids as well as the shadows.

In most landscapes sunshine is a *sine qua non;* the exact hour for taking each particular picture must be carefully studied and decided upon beforehand.

I know many amateurs will say it's all very well for those who can to do this sort of thing, but with one who only goes out a chance day now and again, it's very different. Just so, my kind friend, if it is your wish to expose plate after plate in any light, or under any circumstances, go on, so much the better for the plate-maker, and worse for your reputation and pocket; but if you really desire to obtain pluck and sparkle in your pictures, then you must study, exercise untiring patience, and only expose when it is "just ready."

T. N. Armstrong.

GLASGOW.

DARK-ROOMS.

A MODERN dark-room for the development of gelatine plates and negative paper need not by any means be as dark as the coating room in which the plates or paper are prepared. It might seem, if the matter be looked at from the theoretical standpoint, that the same quality and the same amount of non-actinic light would do in either case. This, however, does not seem to be so in practice. I have seen my friend, Mr. Rau, develop the most sensitive negative paper in a glare of yellow light where I should have feared to risk wet collodion. I need hardly say that the results he obtained were uniformly perfect. On the other hand I was much pleased to see the scrupulous care with which Mr. John Carbutt keeps his splendid coating room cool, ventilated, dark, and yet perfectly wholesome.

Suppose we had to fit up a developing room where none of the ordinary conveniences were at hand, or one for temporary purposes We should first shut ourselves up in the room or closet, or whatever it might be, and sit down, closing the eyes until the effect of the outside light had passed off. Then, after searching keenly for cracks and knot-holes, we should make some arrangement by which, if possible, a pane of good pot-metal yellow glass could be introduced into the door or wall of the room, leaving the lamp used as the source of developing light close to the glass *outside the room* where we were at work, thus getting rid of its smoke and bad smell. If gas were at hand we should do the same thing. If there was no water-tap in the room we might support a large bucket or a barrel at some height over the work-table and bring the water to the plate by an india rubber siphon tube. A handy little contrivance has long been used in England under the name of the "spring clip," for these siphon tubes. It is very much like the common spring clothespin and acts on the same principle, only being round to admit the tube instead of flat. With this arrangement the water will run as long as the clip is kept open, and where water must be economized it is most valuable and convenient. Such an arrangement would do even for the first wash after fixing. The eyesight will be much eased by adapting a fold or two of yellow paper to the glass pane, *i. e.*, making the medium translucent and not transparent. Every photographer will be able to fit up a dark room to suit himself if he has plenty of water, plenty of non-actinic light, good means of getting rid of the slops and washings, and ventilation.

Ellerslie Wallace.

PHILADELPHIA.

COLORED SCREENS IN OUT-DOOR PHOTOGRAPHY.

ORTHOCHROMATIC photography is too well known to require further explanation; but in most cases it has been confined to copying paintings or highly colored objects, etc.; very little has been done in landscapes and portraits, with any attempt to approach color values.

Rapidity, "quick as a wink," "instantaneous" exposure, is the great call, and excellence in results is partially lost sight of.

The object of this article is to advocate excellence; rapidity, if possible, but *excellence*, at any rate.

Suppose it is desired to photograph a landscape with rich foliage in the foreground, water in the middle, and hills in the distance; should the weather be exceptionally clear, there will be no difficulty, but very clear days can not often be counted upon; except on rare occasions the distance is in a hazy blue atmosphere, pleasing to the eye, but difficult to photograph.

Here is the point where a colored screen placed before or behind the lens, will be a great help, as it will enable one to photograph all that can be seen, even to the faintest clouds that rarely show in ordinary landscape negatives.

The screens should be of different colors, from the faintest yellow to deep orange; these can be made either of pieces of plate-glass coated with collodion containing coloring matter such as aniline yellow, plain, or mixed with eosine; aurentia, etc.; or, the same colors may be applied to thin gelatine films.

These screens will, of course, require longer exposures, but, in many cases, it pays in the results obtained.

Orthochromatic plates are quite common in the market, but their keeping qualities are not certain; the preparation of plates with erythrosine is simple enough in the studio, but the plates must be used within a short time; with the screens, no change is required at all in any part of the process, except the longer exposure.

Try it, and you will be convinced.

E. Bierstadt.

NEW YORK.

HYPO IN THE DEVELOPER.

It has long been known that a very remarkable accelerating effect is produced by putting a few drops of the fixing solution into the developer, provided, of course, that ferrous oxalate is the one employed. I do not, therefore, claim to set forth anything new in what I have to say about it, but merely to give my own experience, hoping that it will do something to clear my favorite developer from the charge which probably has done more to injure its prospects in this country than anything else, namely, that it does not allow enough latitude in exposure.

Like everyone else who reads what is published about photography, I had heard of using hypo in this rather surprising way, but still had an idea that it was rather a hazardous proceeding, more likely to result in spoiling a negative than anything else, unless the most extreme care were taken about proportions. But having the other day to develop a couple of instantaneous pictures which were taken as an experiment, and finding the first one rather thin—and it must be confessed that the oxalate is not very powerful all by itself—it occurred to me, while working up the second, that no harm would come from putting in a drop or two of the fixing solution, and seeing if it really would hurry matters. at all. Even if I did spoil the plate, what of it? So in it went, two drops of it. I expected some ghastly effect, but noticed nothing remarkable, except that on looking through the plate it seemed to be gaining strength quite rapidly. On stopping it, which I did pretty soon, and fixing, the result was a strong, clear, plucky negative, admirable in every respect.

My next surprise was with a street scene which I really did want to save—instantaneous, of course. Encouraged by the success of the other attempt, I *started* with two drops of hypo in the developer, instead of putting it in on the way. Result, instant appearance of the picture, as if it had been on a wet-plate. But perhaps it fogged afterward or got weak? Far from it; the development was continued to bring out the detail, and the negative was as clear as a bell, and a little, but not much, too intense.

Since then, I have tried the same process on time exposures, and with fair success. The employment of two or three drops of hypo, say, in three ounces of solution, seems to reduce the time of exposure about six or eight times. There need be no fear of not getting detail. With the time exposures I have not got all the intensity that could be desired, but the detail in the dark parts, and all through, is admirable.

I had hoped to make a thorough series of experiments on this interesting subject, though very possibly such experiments have not only been made, but put into print. Want of time, however, has prevented this so far. And perhaps, after all, to get the control of this seemingly valuable aid in development, it is best for everyone to experiment and learn for himself. It is certainly worth trying; for the oxalate developer must be acknowledged to have many advantages, even for negatives. Not the least is cleanliness, of hands as well as of plate. And with bromide to restrain, which it does with oxalate most efficiently, and hypo to accelerate, it would really seem that the complaint of not having enough "latitude" is somewhat unfair to an old friend.

G. M. Searle.

NEW YORK.

A METHOD OF INK TRANSFER.

THERE are seldom any great novelties in our art, but improvements are from time to time devised, which, though apparently without much importance, lead to better and more certain results. Last summer I had to make photo-ink transfers, and I found—which was not new to me—that the ordinary process was subject to great drawbacks and involved waste of time. This process, as every photographer and engraver knows, consists in coating a sheet of paper with a bichromated mixture of gelatine and albumen of a certain thickness, and after insolation and inking, floating the unprepared side on boiling water, in order to coagulate the albumen and thus harden the whole film before rubbing off the ink from the part not acted on by light. The preparation of the paper is not without difficulty, and should be carried on in a room heated to 80 or 90 deg. Fahr.; the drying of the film requires from ten to twelve hours at the ordinary temperature, and the prepared paper does not keep over a week, sometimes not even for that period; besides, the delicate lines are easily injured from want of continuity in rubbing off the ink, which adheres strongly to the gelatine. To avoid this and other imperfections in the transfer process, it occurred to me to apply a photographic film, consisting of a soluble substance, on a substratum which prevents the transfer from slipping under the press when applied on a stone, or on a zinc or copperplate. The process is simple. It is as follows:

First, the paper is floated two minutes on a warm solution of two grains alum and twenty grains of hard gelatine (Coignet's gold label answers well) to the ounce of water, and hung up to dry. This plain gelatinized paper, of course, keeps well, and can be prepared in any quantity for future use. Then some bichromated albumen—which in a well-corked vial also keeps in the dark for several months—is prepared by adding fifteen grains of potassium bichromate dissolved in aqua ammonia to each ounce of white of egg diluted with one ounce of water. The whole is beaten to a froth and the clear liquid decanted after standing several hours. On this bichromated albumen the gelatine-paper is floated for two or three minutes, pinned up, and in less than an hour it is dry and ready to be exposed under the negative. After insolation the proof is inked by spreading with a sponge a thin layer of transfer ink diffused in turpentine, or, better, by rolling under the press on a stone slightly inked. To develop it suffices to immerse the proof in cold water during, say, ten minutes, to spread it on a window glass or other smooth support, and to gently rub off the soluble albumen with a wet rag. This is done in a minute. Lastly, the proof is passed into a solution of alum, rinsed and dried.

In operating thus I have obtained transfers of engravings which could not be applied on a stone—the lines were too close to print well by lithography—but they answered admirably for photo-etching on copper.

P. C. Duchochois.

NEW YORK.

LARGE TELESCOPES FOR CELESTIAL PHOTOGRAPHY.

The 27-inch refractor of the Vienna observatory, one of the largest telescopes in the world, has given ample oportunities to make studies in celestial photography with large instruments. Most generally the opinion has prevailed that large instruments, owing to their decidedly greater illumination, are better adapted for the photographing of celestial bodies than those of smaller dimensions. It must be confessed, that when I commenced to work I had not the remotest forebodings of the things to come, and the colossal difficulties encountered, when I made preparation to photograph the heavenly vaults with that large refractor.

For my first experiments I had selected the Moon, Jupiter, and Saturn, simply because pictures can be obtained of these objects with a comparatively short exposure, while for fixed stars a more extended time is naturally required, unless one limits himself to the brighter stars only. Besides, the sharp outlines of shadows of the lunar mountains, and the distinct demarcation lines of Saturn's rings, offer much better criteria for the qualities of a photographic picture.

Most of my pictures have been made in the focus objective, nevertheless I did not omit to make enlarged pictures also. As the focal distance of our great refractor equals 10.38 meters, focus pictures of the moon of 9 c. m. diameter are easily obtained.

The lens system of the refractor constructed for the purpose of optical observations is achromatized for optical rays only, in consequence of which the point where they unite is different from that where rays exercising chemical action will meet. The difference between them upon the axis of the telescope amounts to nearly 25 m. m., and it must be presumed the image formed sharply in the optical focus can give but an insufficient, indistinct, and unsharp photographic picture upon a bromide of silver gelatine emulsion film, sensitive in the main for chemical rays only.

To secure better results, nothing was left but to search for the chemical focus of the instrument by experimenting. When found, the pictures obtained were somewhat better, but on account of the great difficulty of uniting the foci of chemical and optical rays, not quite satisfactory. Owing to the difference between optical and chemical focus the pictures are not sharp, blurred as it were by one picture upon another. Interposing a blue ray filter to intercept optical rays, assisted somewhat, but not quite sufficiently to secure a sharp photograph.

After all these unsuccessful trials with the large telescope there was but little hope for my attempts in celestial photography, being well aware that to obtain practically useful pictures the whole lens system must be corrected for chemical rays.

My attention had at that time been directed to color-sensitive plates. I employed them for making photographs in the optical focus of the lens, and prepared erythrosine bath plates, by subjecting bromide of silver gelatine emulsion plates to a solution of—

Distilled water	100 c. c. m.
Erythrosine solution (1:400)	2 c. c. m.
Aqua ammonia	10 min.

and allowing them to dry after being colored.

With these plates, to be developed with alkaline pyro, ferrous oxalate being less appropriate, extremely sharp pictures were obtained, especially so when a yellow-colored plane-parallel glass has been interposed. The time of exposure is the same as with those plates upon which the blurred pictures, taken in the chemical focus, were made.

It follows then that optically achromatized telescopes may be employed in celestial photography, admitting, however, that they are less appropriate for the purpose than chemically corrected telescopes and reflectors by which chemical and relatively all rays can be united in one point. The work is done by a fractional part of rays (optical) only, which fall from the object to be photographed, directly upon the objective.

As long then as we do not possess large telescopes corrected for chemical rays, those we have now at our command may be employed for photographing bright objects like the sun, moon, stars of the higher magnitudes, etc. With the long foci of these objectives, and their great luminous power, we have the advantage of obtaining comparatively larger pictures than with smaller chemically achromatized instruments, or the attachment of a magnifying system, by which not only the time of exposure is very much lengthened, but the whole work made more difficult throughout. With the enlargement of small focal pictures, the grain of the gelatine film will prove detrimental to the result.

One of the advantages offered by the 27-inch Vienna refractor over the photographic telescope of the Paris observatory, with which the brothers Henry have made their interesting photographs of sun, moon, planets, etc.,* may be estimated by the fact that color-sensitive plates have given focal pictures three times larger than, and of superior sharpness to, those made with the Parisian telescope. On account of the long exposures required, this instrument can never rival the large refractor of the Vienna observatory.

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* In contradistinction from stellar photography proper, this branch of celestial photography might be termed planetary photography.

The greatest impediment encountered in the use of large instruments, and one quite difficult to remove entirely, will be found in the mechanism keeping them in motion during photographic exposures. To propel a large telescope of such colossal weight as the Vienna refractor of 8000 kilograms, by means of a clock-work, to move it proportionally uniform with the object to be photographed, and without any displacement of the picture upon the sensitive plate, is extremely difficult to accomplish. The movement of the telescope in circles, parallel with those celestial objects described on the heavens in consequence of the earth's rotation is caused by cog-wheel systems and weights. Shocks will easily occur with them; they displace the picture upon the plate and injure their sharpness.

It will be necessary then, to mount with the main telescope another, of not too small dimensions, a finder, or as it may more properly be called, a pointer, by which the course of the clock-work may be followed and carefully watched, keeping in view a certain point in the object to be photographed, or a neighboring fixed star, by means of a cross-wire placed in the focus of the instrument. When in consequence of any irregularity of the clock-work, the even progress of the telescope is interrupted, it runs too fast or too slow, the error must be at once corrected. If such corrections are inevitable, or become necessary, in planetary photography, the result will always be uncertain, as it is exceedingly difficult to increase or decrease the movement of the telescope with requisite accuracy.

It might be more advantageous to the general result to connect camera and plate with movable micrometer screws, and effect corrections directly upon the plate. The siderostat, an instrument by which a pendulum clock can be kept in constant and uniform motion has apparently not been sufficiently experimented with.

Many researches and improvements must be made before celestial photographs can compare with what we see by ocular observations, and with a good telescope.

I will additionally mention the impossibility of obtaining uniformly good photographs of the unevenly illuminated disc of the moon. Various parts of it are in stronger light than others, and require a different time of exposure, hence better results are had when photographing the moon in parts only.

I have given the above subject more detailed consideration in the *Photographische Correspondenz*, to which I call the attention of the interested reader.

Rudolf Spitaler,

Assistant at the Imperial Observatory.

VIENNA.

NOTE.—To illustrate the above article Prof. Spitaler sent a negative of the moon 3¼ inches in diameter made by the method described. The negative arrived here broken, thus preventing its use as a specimen of the Professor's excellent work.—EDITOR.

ABOUT BROMIDE PAPER.

I HAVE entirely abandoned the use of silver paper. I use the paper negatives, and do not oil them, and in connection with an unoiled paper negative bromide paper is so quick, and such little trouble, that I don't think I will ever again use the silver. I have not got as far as the stripping film yet, but expect to reach it before long, although I must admit that the ordinary paper negative is quite good enough for me.

As I have never seen in print this method of developing bromide paper, I hereby give it, for I think it is worth trying, especially by those who, like myself, want to do things as rapidly as possible, and have no extra time to throw away.

I use on my travels a 4 by 5 Scovill Camera, which I think is the neatest, and prettiest, and most handy instrument I ever saw, and I have examined and tried cameras of different makes in most of the countries where cameras are made. I have a great admiration for the English make of camera, especially its folding up arrangement, but this particular instrument, for whose use I have abandoned all others, is as compact as an English camera, and at the same time is much stronger, and will stand mountaineering and "roughing it" in a way that an English camera will not.

I develop the bromide prints, a half dozen at a time. As the bromide paper comes in packages of a dozen, two developings get through with a package. I use six printing frames, and set them round a lamp in a circle. I always use a lamp even in the daytime, and always use the same lamp so that I can calculate exactly on the strength of the light. When the time expires I turn down the light and put the prints in a dish of water.

I have a 10 by 12 shallow dish of porcelain, such as is used for toning, and I take the half dozen prints out of the water and place them face upwards in this, and they completely cover the bottom of the dish. They will stick to their places as if they were pasted there, because they have been soaked in water. Then I take about quarter the amount of the developer that I would need if I were developing them in the ordinary way, using it pretty well restrained, and flow it quickly over the prints. I follow this instantly with a brush of soft camel's hair three inches or more broad, and brush up and down along the surface of the prints. The way the pictures come out under this brushing is one of the most beautiful things in photography. It seems as if a person were painting on the pictures. You can tell exactly when a picture has gone far enough, as there is no perceptible amount of developer over them. The moment a picture is done it is taken out and placed in the acidulated water while the brushing is kept up on the rest until they are finished. The amount of work that can be done in this way would astonish the man who works by ones or twos in the ordinary developing dish.

On page 203 of last year's Annual there is a description of Eastman's Web Bromide Printing Machine. It says that the machine cuts off each picture. If I owned one of those machines I would cut off the cut off arrangement. Web pictures should be developed in strips about eight feet long in the way I have indicated. This is an immense saving of time, which is of course desirable where a person is printing a large number, as for a book. Any tinsmith can make a tin developing tray, say eight feet long, the requisite width, and a couple of inches deep. In this the strip is placed, and the dish filled with water. Then as it lays flat, with the water poured off, the developer is used in the manner I have described with a broad brush, and the whole strip can be developed in the same time that a person would take to do one or two pictures.

While I am on this subject I may mention something that I wish somebody would invent. Most of us have roll-holders, and if we haven't we ought to get them. It seems to me that an attachment could be made that would fit on an ordinary roll-holder that would enable the possessor to use the holder as a Web printing machine for bromide paper. The bromide paper, instead of the negative paper, could be put in the holder, and of course it would be exactly the same width as the negatives you would have from the same machine. The paper could be worked forward just as the negative paper is, and the attachment which would hold the negative could either be made to raise as it does in the web machine, or it could be covered from the light as the paper passed under it. An attachment of this kind would be a boon to amateurs who can not afford a regular Web printer, or who have not work enough to justify the purchasing of one, while it would not interfere with the ordinary use of the roll-holder for negative paper or American films.

If somebody else don't invent this sort of thing, some day, when I have a few minutes to spare, I will invent it myself.

Robert Barr (*Luke Sharp*).

DETROIT, MICH.

FIGURE, LANDSCAPE, AND COMBINATION PRINTING.

ALTHOUGH not really a rule of composition, it has been for years a sort of, shall we say stage direction? that in landscape pictures the figures, if any are introduced, shall be subordinate to the scene, and that if figures are the subject, that the landscape shall be kept down. This is a good healthy direction if it is not abused, but like everything else that is good—even combination printing—it is worse than useless if it is not properly understood and applied, and will tend to fetter instead of help the artist.

But there are no rules without exception. In "*Pictorial Effect*" I have said that good pictures may be made without much sacrifice of either landscape or figures, "but the subjects must be fine, and the skill of the artist great, or the success will be hazardous."

Well, I think that all will agree with me that the skill, both of painters and photographers, has greatly increased of late years, and that many of them need not be afraid to attack difficult subjects. That painters are not now afraid of subjects in which both figures and landscape are of importance and are harmonized, is increasingly evident annually in the Exhibition of the Royal Academy. It was especially noticeable in the last exhibition, where such pictures were conspicuously numerous on the line.

Photographers always seem to look to painters for authority in art—here they have it, and, therefore, it is legitimate to place large figures in important landscapes.

There has always, to those who limit their ambition to what can be produced on one plate at one exposure only, been a technical difficulty in the way of any attempts of the photographer to obtain these pictures—the difficulty of getting focus and definition in sufficient depth. It is found that in the endeavor to get a large figure in the near foreground, with a distant scene as background, any approach to possible focus is hopeless; one or other must give way. Now, although I do not object to parts of a picture being judiciously a little out of focus, any quantity of undefined smudge is not to be tolerated. Therefore these very tempting subjects must be given up, or done in some other way. Fortunately there is another way. By the aid of combination printing subjects beyond the reach of ordinary photography may be successfully grappled with.

It would be useless here to go into the details of combination printing. My purpose at present is to point out how very much further this method enables a photographer to go, and that the process is not nearly so difficult as it looks. All that is necessary is to determine never to uselessly apply the process, never to do on two plates what can be done on one, and to thoroughly study your subject before you begin it, so that there should be no departure from the truth of nature, and that the necessary joins come in the easiest and most natural places. Everything else is simply a matter of care and patience.

But supposing there are difficulties. The photographer should rejoice that there are still left in the art some things calculated to call for all the knowledge and power that skill and experience can bring to bear to produce a successful result.

H. P. Robinson.

TUNBRIDGE WELLS, ENG.

MARINE SHOTS.

THE detective camera is thoroughly at home in open sunny streets and on the waves. Especially on the water, under a slanting morning or afternoon light, when banks of shadowful cumulus clouds lie along the horizon, when a brisk breeze dots the rollers with curling caps, breaks the hollows into bewildering cross ripples, and fills the sails of the scudding craft, the opportunities for pleasing pictures are endlessly varied, and the favorable conditions of lighting and exposure bring success to gladden the heart of the amateur whose essays on land yield mostly window-glass effects in lieu of foliage and crude silhouettes of animated groups. Given a dozen marine exposures, with a steady hand and a good eye to judge of light and shadow and pictorial composition, and he or she is indeed unlucky who can not produce a dozen fairly satisfactory negatives.

It is surprising how small a stop can be used on a sunny waterscape. If the shutter be not too rapid, a common wooden drop for instance, $\frac{f}{45}$ will give singularly brilliant contrasts. A little pill-box of a wide-angle lens with middle-size aperture, or an eight-inch Waterbury with a diaphragm opening as large, or as small, as a lead pencil, will do the work on a summer's day. But for my part I prefer to use the greatest shutter-speed attainable and allow a rather more generous aperture. I have a theory, confirmed by four years of desultory experience in shutter work, that the initial impact of light on the sensitive film does the business more than the time during which it acts, and that snappier views are got by doubling the area of the stop and trebling the speed of the shutter rather than by striving after "depth of focus" or marginal definition at the cost of a blurring in the lines of a rapidly moving yacht or steamer. In a twenty-knot, whole-sail breeze, a vessel reaching or running free travels at a prodigious rate. Sharpness at the edges is in this class of pictures of little moment, for the principal object is, or should be, in the center of the field where all the needed crispness of definition can be secured with a wide-open lens. Remember, too, that the operator's position is not always steady, that it is often on a tossing boat or jarring steamer, that the detent of his detective shutter is generally released by pressing a button on the box itself, and that these together give a motion to the camera at the instant of exposure, relatively to the objects in focus, greater than if it were fixed on a tripod and aimed at an express train or a running horse. Speed of shutter is the first requisite if a sharp picture of rapid motion, capable of enlargement, is wanted.

My own favorite box is a home-made affair, with a fixed focus, set to fifty feet distance so that thereabouts and beyond all objects are microscopically defined on the film. A Suter lens, that will cover 5 by 8, is used on $4\frac{1}{4}$ by $5\frac{1}{2}$ plates—a well proportioned and convenient size. I have a Prosch duplex shutter with a powerful spring, so that an exposure is seldom longer than $\frac{1}{100}$ of a second, and oftenest half of that. The pneumatic release is preferable, always remembering to squeeze only the bulb with the disengaged hand, and not the camera with the other if you wish to eliminate all jar. So adjusted, $\frac{f}{16}$ or $\frac{f}{22}$ in bright noon sunshine, $\frac{f}{11}$ in hazy or late light, and $\frac{f}{8}$ in rain, will give an easily developable plate and good density without risk of veiling or frilling through prolonged chemical action. But with a slow shutter, such large stops may result in over-timing.

I prefer a view-point well out in the waters, where wind and sun can play unrestrained. The lower deck of a steamer, or better still, a ducking-blind in the Potomac some distance from the shore and on the edge of the channel, makes a good "coigne of vantage." The direction of the sunlight is important. If directly behind the camera, it is apt to make the ripples monotonous and expressionless; if in front, the tiny glints of sun-reflection develop as peppery spots. Keep the sun on the right hand or the left as much as possible, and take shots in mid-morning or mid-afternoon when the slanting light makes the water look fairly alive. A downright noontide glare, especially if the surface be stillish, is likely to render the water almost as dense as the sky—and your yacht or river scow swings, like Mahommed's coffin, in a skyey blank with only a few shadow ripples below it. I would rather take my chances for an artistic waterscape half an hour before sunset than at high noon.

For subject, choose any kind of sailing craft rather than waste plates on steamboats and dull black steamer hulls. They all bear a desolating family likeness in the prints, save when the signboard name differentiates them. But the bellying sails, the churning foam under the bow—which the old sea-dogs call "a bone in her teeth"—the swelling rush of water along the gleaming sides, and the creamy wake, are all instinct with life and are ever different. I have taken a dozen shots at a two-masted canoe, jibbing and luffing about my ducking blind, and each view has its individual charm to the nautical eye. A hundred of the same craft would still afford infinite variety.

The lighting of the sails should be closely studied. A beam view is most wretched, with the sails trimmed flat, like meaningless sheets of pasteboard, hardly distinguishable from the sky beyond; although against a dark cloud-bank an effective contrast may be obtained. Get the canvas in shadow, relieved against a bright or dappled sky, and the view changes as if by enchantment. The most beautiful effects of all are when the point of sight is on the weather quarter of a close-hauled sloop, pointing sunward. There is a peculiar charm, too, about a view on the lee bow, with the sun shining through the sails and showing every seam and detail, while the vessel heels over into a long billow of following water that laps her rail. But thrice happy is he who seizes a flying yacht, with spinnaker set, hurrying bow on, straight towards the lens. It needs a steady hand and quick eye to snatch the fortunate instant, for like a flash the mountainous canvas looms up and fills the field, and it is too late. It is worse than shooting a fast incoming pigeon at eighteen yards rise.

My experience is that, for snap shots with a fairly good brand of plates, any developer will serve, if one knows how to use and restrain it to obtain needed density. With a liberal aperture, say $\frac{f}{8}$, or at most $\frac{f}{11}$, and using rapid spring-tension, ferrous oxalate in saturated solutions, in the proportion of six parts of oxalate to one of iron, gives undeniably the most brilliant marine prints, that tone into delicious purple browns. Under the autocratic rule of pyro-and-potash or pyro-and-soda, the knack of producing artistic atmosphere and delicate half tones of glorious purple on the albumen surface is rapidly becoming a tradition of the wet collodion days. It is this among other causes that is driving us to bromide and platinum prints. There is an all-pervading tendency to brickiness and crude brownness in modern albumen prints, which no manipulation of the toning bath can overcome so long as the strong fixed alkalies are employed. Ammonia development, well restrained with ammonium bromide, is better in its printing results, but it is stainy and risky. One of the snappiest plates I ever handled was treated in a rule-of-thumb sort of a way—an indeterminate chunk of dry pyro, perhaps ten grains, perhaps twenty, being thrown into half a tumblerful of ice water, to which was added, drop by drop, a mixture of about equal parts of strong ammonia and a 100-grain solution of ammonium bromide. Another fellow did it,—I have tried it and confess to abject failure. My own preference is just now leaning toward hydrokinone, which, although new-fangled and dear, possesses excellences particularly its own. It stains neither fingers, linen, nor—what is most important—the negative. It is singularly effective, yielding detail without limit and all the density wanted. In giving printing quality it is better than ferrous oxalate, the film being pure in color through all the range from inky black to transparency, and never sandy gray or umberish brown. It can be seen through, even in the densest parts, by strong light, and this gives to the prints a most desirable atmosphere. But it calls for certain precautions. The solution is and remains as clear as water, and so does not protect the film from an unsafe light in development, as does a deep bath of red ferrous oxalate or brownish-red pyro. Put an exposed plate under an inch of ruby-tinted ferrous oxalate in a vulcanite tray, and it can be taken into mild diffused daylight and developed with little or no chemical fog. Not so with hydrokinone. To render the light safe, a sheet of copper-flashed ruby glass should be backed with yellow glass and, after testing with the spectroscope to make sure that the tell-tale greenish band is absent, should be further shielded by a sheet of yellow envelope paper.

I use a simple formula, thus:

A.—	Hydrokinone	120 grains.
	Sodium sulphite, crystals	600 grains.
	Water	10 ounces.

B.—	Sodium sulphite, crystals	2 ounces, avoir.
	Potassium carbonate, chemically pure	3 ounces, “
	Water	8 ounces,

Or better still, perhaps, a somewhat complex formula based on Prof. Newton's old hobby—yellow prussiate of potash :

B.—	Potassium ferro-cyanide (yellow)	1½ ounces, avoir.
	Potassium carbonate, chemically pure	1½ ounces, “
	Sodium carbonate, dry, chemically pure	1 ounce, “
	Sodium sulphite, crystals	2 ounces, “
	Water	10 ounces,

To use, take for a plate of ordinary detective size one ounce of the hydrokinone solution, dilute with from half an ounce to one ounce of water, according as density or softness is desired, and add slowly anywhere from a dram and a half to three drams of either of the "B" solutions. If the stop was small enough and the shutter rapid, no "allaying Tiber" in the way of bromide is needed.—but with $\frac{f}{11}$, and particularly $\frac{f}{8}$, a few drops of a 50-grain solution of potassium bromide is advantageous. The image is slow in making its first appearance, but there is no need of hurrying to add alkali, for when development is once started the film gains density rapidly, and less time is required to complete it than with pyro-and-potash. Let it go on until the plate begins to look hopelessly dense—it will come out all right in the hypo, and marine views need a vigorous negative to give bold and pleasing prints. And, above all, use two hypo baths, transferring after fixing in the first, to a fresh solution in a second tray.

I would hardly, with my present knowledge, venture to aver of hydrokinone, as good Dr. Boteler did of the strawberry, that a better was never made, but in the hands of the amateur who, like myself, works sporadically, the amazing range of failures due to stale pyro, decomposed iron, evaporated ammonia, pyro-stained hypo and what not, would appear to be decidedly limited by its substitution.

A. A. Adee.

WASHINGTON, D.C.

DETECTIVE CAMERAS.

The first impression which the description of the Detective Camera and its performances gave me was that it was a toy, good for the amusement of grown-up children, but never likely to accomplish any actual work worth keeping. More recent experiences have modified very greatly this impression, and I am now disposed to rank it as the most important recent development in out-of-door photography. Of course, in my consideration of it, I separate entirely the so-called Detective from the small cameras which, taking the same size plates, and capable of doing, under certain circumstances, instantaneous work, are still Tripod Cameras, and subject to all the annoyances of the larger sizes. The essential of the Detective Camera is that it shall not attract attention, but be capable of working, when favorable subjects offer, without the object being aware that he is being photographed. It is, of course, limited to out-of-door work, for the best-lighted interior is too dark to give a sufficient impression to the sensitive film to enable an instantaneous picture to be taken except with a lens of so great aperture as to be practically unfitted for this kind of work. The Rapid Doublets, Morrison, Wright, Ross, Dallmeyer, Beck, and Optimus amongst European lenses are those best fitted for this class of cameras, combining, as they do, to a fair degree, depth of focus and covering power, with large apertures, so that they give a quick result with tolerable sharpness all over.

Instantaneous pictures, so-called, are, as everybody is aware, far from being actually instantaneous, *i. e.*, taken in an inconceivably short interval of time, but if only the fiftieth part of a second is occupied, most objects in motion will be taken with sufficiently good definition to pass for instantaneous, and in many cases more than that, and even as much as the fifth, if motion is not rapid, may be given.

The primary requisite then for a good Detective Camera is that it shall not be noticeable as a camera—a plain box resembling a case of instruments, and, I think, preferably covered with leather, so that there shall be no glitter to catch the eye, and inside which, for the same reason, all the mechanism shall operate, except the spring which releases the shutter, the key of the roll-holder, and the index of the focus of the lens, will fill the general conditions of a good Detective Camera. The general question of plates or roll-holder is to be considered in this question as one, not of paper or glass, but as affecting the using of the camera in such a way as not to attract any attention, or betray to the bystanders the use of the instrument, and for this, the roll-holder possesses incontestably great superiority, for the reason that the paper can be changed by the turning of a screw-head, while when plates are used the plate-holder must be changed openly, an operation which at once gives the whole object away. I consider, therefore, that the ideal Detective shall employ a roll-holder. The manner of operating the renewal of the paper is also to be considered, and I am of opinion that the key should be on the top of the box, as any necessity to turn the camera over so as to work it "upside down" will disclose the operation. The milled head, or key head, which controls the roll-holder should, therefore, be on the top of the box, or if on the bottom, should be so arranged that it can be noted by the touch as well as by vision. This is practicable for handy operators, but there will be always some people who must see to understand anything. The index that revolves to show the position of the roller in the roll-holder being made with a rather long indicator, a pin set at the point where that indicator should stop will enable the touch to control the movement perfectly. The same arrangement may answer for the focusing lever or screw if the operator has a delicate touch, but is not so sure with heavy-fingered people, because the only arrangement would be with successive points, each indicating a focal point to distinguish, which is not so easy as where only one is in question. The releasing button or spring comes naturally underneath or at the side, and for structural reasons I should say the former, but as it is small, and may be made invisible, it is of no importance where it goes.

Beyond these conditions the size of the box is of considerable importance and must be the smallest which can contain the apparatus. If plate-holders are used only one should be allowed for, as the extra ones are better kept in the pocket. We do not in America regard sufficiently the question of compactness, and most of the American apparatus as compared with the English, while of less weight is more bulky for want of consideration of travelers packing their luggage closely. It is always better to carry the camera in one package, and the holders, etc., in another, for several reasons—divisions of weight, security from accidental exposure, freedom from mistake, etc.,—and all these considerations tend to favor the keeping the camera so small as it is possible to make it.

The question of a shutter is one which is of importance to the constructor even more than to the user of the Detective Camera. As focusing is not practicable it is useless to calculate on giving any facilities for that and the shutter, by whatever plan it may be worked, should not return so as to expose the plate or paper, when it is adjusted for exposure. It should be continuous in its action if revolving, and in this respect the shutter employed in the breast camera is correct in its action. When a revolving shutter returns on itself for adjustment the aperture of the shutter passes that in the permanent screen when the latter is not closed, and leads to accidental exposure of the plate. It is not wise to make two distinct precautions necessary when one will suffice against this accident, therefore a good shutter should be continuous in its action. The breast camera seemed to be at first report not only a toy but a useless toy, but a closer examination satisfies me that for certain purposes it is the only practicable form. I have been in countries where even a common Detective Camera of the most unobtrusive form would attract curiosity and make its use impracticable from the crowding of the people around any strange thing. In these cases the breast camera, either as now made or in an analogous form, will be indispensable. As the present form has proved the practicability of the invention, it is certain that we shall have in a short time numerous adaptations of the idea, and probably of the roll-holder to it. This will give the maximum of convenience and compactness. The employment of paper instead of glass in the Gray Camera, which is already accomplished, is a step in advance, but the desideratum is a breast camera which shall employ a continuous and practically inexhaustible supply of film, making a picture of the approximate dimensions of two inches each way, that being, I conceive, the maximum attainable with the short focus which the breast camera permits. We are here limited by the distance from the lens to the sensitive film being restricted to the space which can be given between the inner and outward garments without attracting too much attention. Supposing this to be two and a-half inches, we must have a lens capable of covering an angle of about 45 deg., which is as much as an instantaneous exposure will cover to advantage, giving such a degree of definition as will enable enlargements of three or four diameters to to be made. Beyond this it is needless to go.

The present form of breast camera, Gray's "Vest Camera," is a really useful instrument for cases in which no other form of camera can be used, but it is absurd to conclude that this must remain long the maximum of our attainment. It is even venturesome to say that an advance in sensibility of our films may not be made, which shall permit the use of a lens with an aperture so small as to give good definition over an angle of 90 degrees, which would give, with a focal distance of two and a half inches, a field of five inches in diameter; or that a lens may not be made which, with an opening as large as is permissible to a breast camera where concealment is indispensable, will give definition over a larger field than can now be covered properly. But so far as we can now compare the condition of photographic achievement, we can not hope to obtain, with the camera concealed under the clothing, as is the Vest Camera, a picture larger than two inches to two and a half inches, of a really useful quality. The chief drawback to Gray's Camera is the necessity of opening the camera in a dark room to change the plate or film, which makes it practically limited to a fourfold exposure, or four negatives for each excursion in a difficult country.

In any circumstances, we must look to the Detective Camera, in some form, in some shape, for any important advance in such work as involves the extremely important conditions of unconsciousness in the subject of the photograph, and of constant readiness for securing a record of passing phenomena on the part of the operator.

Add to this that under the most favorable circumstances the negative of the ordinary Detective Camera of 4 by 5 inches can be enlarged to 8 by 10 with excellent results, and we see that for tourists, and especially for book illustrators, the Detective Camera is likely to supersede all other forms of photographic apparatus. Warning to all inventors.

W. J. Stillman.

LONDON.

OBJECTIVES FOR PHOTO-MICROGRAPHY.

THE compound science of photo-micrography is, I believe, the most "rising" youth of the present day. Time was when the highest microscopic authorities condemned photographic delineation of microscopic objects wholesale; now matters are much changed, and still quickly changing; and probably a photographic reproduction of a microscopic object will before long be accepted as the most useful, the most faithful, and altogether the most perfect educational and critical delineation obtainable. So long as ordinary sensitive plates, wet, moist, or dry, had to be used, undoubtedly our photography of such objects was difficult or impossible, doubtful in veracity, or absolutely and evidently deceptive. "Color-correct," or "Orthochromatic," or "Isochromatic" photography has worked a great, an astonishing, an incalculably beneficial change in photomicrography. But it is not with "color-correct" photography I propose here to deal.

My wish is to induce, as far as I can, many amateurs in America, and wherever this lordly ANNUAL may reach, to bring their minds, their energies, and their purses, to bear on photo-micrography, for it is pretty patent that in photo-micrography we shall find a field not only of intense interest to ourselves, but of immense utility to our fellow-men. Now I am perfectly well aware that a great many grand workers in amateur ranks are held back from this pursuit by an idea that the objectives required are exceedingly high in price, and that a very large battery of object glasses is required. My aim is to undeceive such would-be micrographers.

If I believed that wide-angle expensive lenses were the best for photo-micrography, I should assuredly advise readers to use them, even if I had in the same sentence to recommend the "knocking off" of champagne and oysters, Delmonico's and canvas-back ducks, for a time, or even if I had to suggest the exchange of those terrible green cigars you so affect "over there" for a clay pipe and cut cavendish. But you can stick to your "full-flavored" weeds, your oysters and your ducks, and buy cheap, or at least medium-angled object glasses, and go right into photo-micrography with assurance that you have all the qualities you want, provided that the lenses are good of their kind.

Let us examine the *desiderata* for lenses for various work. Where we have to perform feats of resolution, as with some of the crucial diatoms, and especially when we are bound to use light more or less direct, then certainly we must have lenses of wide angular aperture, and preferably immersion lenses of large "numerical aperture." But even here we have two points to consider: First, that increase of angular or "numerical" aperture means decrease of two vastly important qualities, viz., penetration and flatness of field. Second, that by well-managed oblique light wonders of resolution may be performed by lenses of comparatively low angular or numerical aperture. An experienced worker will resolve with a good quarter-inch of (say) 90 deg. and oblique light, objects that a bad worker will fail to resolve with much "finer" and more expensive objectives. Still if the reader proposes to work miracles of resolution I advise him to get the widest angle lenses he can find. For each work I *try to use* a Zeiss apochromatic 3 mm. lens of N. A. 1.4, perhaps the most perfect lens ever introduced for such purposes. I say advisedly, "try to use," for there are difficulties in the working of this lens to one who, like myself, is not really *au fait* in such crucial work.

But the great field of micrographic ability is certainly not bounded by feats of resolution. Far from it. More interesting to ourselves, more easy of attainment, more useful to humanity, are such branches as physiology, pathology, histology, embryology, bacteriology, entomology, and so on; and I have no hesitation in asserting that very wide angled objectives are *not* the best for these branches of micrography. For ocular examination of an object the objections to a wide-angled objective are of comparative indifference to us. If there is a want of penetration we can change our focus, if the field is round we can shift the position of our object, so as finally in both cases to have perfect views of every part of our object. In photo-micrography this won't do; during exposure we can neither change our focus nor move our object. As increase of angular aperture decreases penetration and flatness of field, it is plainly better to avoid unnecessary width of angle.

It is not so easy to write about focal length of objectives, for we are generally more bound down in this matter. We require a certain amount of amplification, and we have three methods of attaining great amplification. 1st. By using short focus objectives. 2d. By increasing the distance from objective to plate. 3d. By eye-piecing. So far as I can see, the defects of all the three systems advance practically with the magnification in equal ratios. Theoretically, perhaps, this is not strictly accurate, but practically I find it holds good with such instruments as I have used. If, say, a quarter-inch lens at four feet distance shows want of penetration, a one-sixth giving the same amplification, or a half-inch, eye pieced to the same amplification, shows very much the same defect in the same degree. This is my experience, and the lesson I gather is simply this, to avoid straining any lens beyond its power. A very well corrected lens will stand eye-piecing or stretching better than a less accurately corrected one, but the best lens has its ultimatum of power, and we must not go beyond that. My impression is—but it is only an impression, and I state it with great caution—that eye-piecing aggravates any want of penetration inherent in an objective, while over-stretching of the distance between lens and plate aggravates roundness of field. Great has been the controversy as to the advantage or disadvantage of eye-piecing in photo-micrography; personally I do not like to use any ordinary eye-piece, achromatic or otherwise, but I find no harm to arise from the use of an apochromatic eye-piece, and I use the latter form not only of necessity with apochromatic objectives, but with satisfaction with ordinary objectives of medium angle. I have eye-pieced, with a Zeiss No. 6 projection apochromatic eye-piece, a one-twelfth hom. imm. lens by Swift, and at twenty-four inches from eye-piece to sensitive plate got a very satisfactory negative of certain *micrococci*. I have never used any objective of less focal length than one-twelfth inch, and I have no wish to use such. Dr. Maddox agrees with me in seeing no advantage that can be gained by any higher power for photo-micrography, and Professor Abbe expresses a very similar opinion when he doubts the desirability of going beyond an objective of 3 mm. (one-eighth inch) with a numerical aperture of 1.4.

I have already written, perhaps, too much for the editor of this yearly hand-book, and I shall therefore conclude by suggesting angular apertures which I think will be found ample for such lenses as are in common use by microscopists and photographers.

A 2 inch focus objective should not in angle exceed 18 deg.
1 ″ ″ ″ ″ ″ ″ ″ 25 deg.
$\frac{1}{2}$ ″ ″ ″ ″ ″ ″ ″ 45 to 50 deg.
$\frac{1}{4}$ ″ ″ ″ ″ ″ ″ ″ 90 deg.
$\frac{1}{6}$ ″ ″ ″ ″ ″ ″ ″ 110 deg.
$\frac{1}{8}$ (dry) ″ ″ ″ ″ ″ ″ 125 to 130 deg.
$\frac{1}{12}$ hom. imm. ″ ″ ″ ″ N. A 1.25

These are mere suggestions, but they are the outcome of careful consideration, and of experience short but watchful.

Andrew Pringle.

London, Eng.

PORTRAITS IN IMITATION OF OLD PAINTINGS.

These may be effected by the following easy process: For a background procure a coarse canvas—the common furniture packing called, I believe, "burlap," will do. Nail it with tacks on a frame, say 2 by 3 yards, and stain it with a medium dark brown color, mixed with water and a little glue or skimmed milk, taking care not to clog the threads of the canvas. Place your subject against this background, and after exposure, according to the sensitiveness of your plate, close the cap, remove the plate-holder, and without moving the camera from its original position, focus anew on the canvas, the figure, head rest, etc., having been removed. Expose again for the plain canvas the same duration as for the portrait, or longer if you want the texture of the canvas showing more prominent. In order to facilitate the focusing on the dark background pin a scrap of a large printed newspaper advertisement on it.

The length of exposure on the plain canvas will depend on the qualities of the plate, and of the lens. If not long enough, the lines of the canvas will show but faintly; if too long the canvas lines will be too predominant. Any sea or landscape negative might be treated in a similar way in order to give it the appearance of a copy from an oil painting by an after-exposure before developing on a plain canvas, which, for this purpose, should be of a finer texture, and a rectilinear lens used instead of a portrait combination. The printing ought to be carried somewhat deeper than for ordinary portrait negatives.

Karl Klauser.

FARMINGTON, CONN.

THE LIGHTNING PHOTOGRAPHER;

A SKETCH OF THE FUTURE.

IT is midnight. A storm is raging, and heavy rain drops rattle against the window. No twinkling starlight breaks through the dense cloud masses passing over the heavenly vault, an inky black envelopes the landscape near and far to its utmost extremities.

Edward and his cousin John, the latter waiting for the two o'clock A. M. railroad train, to take him off to far distant lands, have met to pass the last hours before parting in pleasant communion, and to discuss the contents of a cheering bowl.

"It is sad to part," says Edward, "but let us utilize the short time left to us, to perpetuate the event of our last meeting, with a photograph. Long since have I contemplated to have a picture made of my domestic recluse. We will have it done now, while you are still with me."

A tap of the bell brings Emily, the maid of all work. "Go to the next street corner," says Edward, "and summon the lightning photographer who dwells there, to appear at once, prepared to make a picture of us and our surroundings."

Emily sallies forth, and finds at the corner house a sign displayed, "Photographer's Night-Bell," and delivers her message to the *night operator* in waiting. "I am at the service of your master," responds the disciple of the black art, "as soon as the usual advance payment has been made"; and after a quarter of an hour we find the operator in Edward's sitting-room, arranging tripod and camera, placing in position magnesium lamp and reflector. A group of the two friends is posed near the chimney-piece, focus taken by lamplight, and while they are still engaged in pleasant conversation—flash—a momentary light illumines the room, to give place again to the former relative darkness.

"Very much obliged to you, gentlemen," says the photographer, who has recapped the lens, returned the slide to the plate-holder, and begun to pack up his traps.

"Hm—ha—is it not advisable to make another trial, to be quite certain of success?" asks Edward.

"To do so is absolutely unnecessary," answers the photographer. "Our new method is certainty itself; with it failures can never occur." And as a matter of fact, we see, a few days afterwards, upon Edward's center-table, a magnificent photograph of the scene, while John is still tossing upon the briny deep.

It is noon. A July sun sends its scorching rays to the earth, white cumulus clouds reflect the intense light, a dazzling brightness pervades the whole atmosphere.

Miss Olga has at last consented to have her picture taken, and enters the first-floor studio of Mons. Short, the eminent lightning photographer.

"Do you wish to be photographed by day or by magnesium light?" inquires the polite artist.

"I prefer the magnesium light! Make a picture like that of my friend Maud, so much admired for its unsurpassed, beautiful expression, as true as nature."

"Then please descend to the basement." And fastidious Miss Olga is ushered to a stylish boudoir in the basement, lighted with one window only.

"Delightfully cool," she remarks; "with such surroundings and in so pleasant temperature, one would wish to be photographed every day."

A red curtain drawn across the only window allows but a feeble light, to pose the young lady. A flash of magnesium light—the picture is taken, and Miss Olga, expressing the deepest regret for the short duration required to make pictures under such pleasant circumstances, ascends again to the higher, broiling and sunlit regions.

How long a time will elapse before such events as are depicted in the above sketches will become every-day occurrences is difficult to say; still, the rapid advances being made in the present era give good grounds to suppose that it will not be a great while.

A life-like portrait can be taken by a momentary exposure only. To make, however, an artistically well-lighted picture in our daylight studios by instantaneous exposure is quite impossible, as we are compelled to cut off light here, or to subdue it there by drawing curtains in order to obtain desired effects, which includes also a reduction of the light force, and consequently an increase of exposure at the best to seconds. The necessity of the subjects remaining motionless for even such a short time results in forced or unnatural expressions.

To photograph in a darkened room by magnesium flash light must result differently and better. If one gram of the powder is ignited within one meter from the subject, the emanating light is equal in effect to that of the brightest sunshine. Its combustion requires by accurate measurement exactly one-fortieth second. Motions of the subject in this extremely short space of time can scarcely be perceptible upon the plate.

Head-rests have become obsolete with magnesium light, unless it be absolutely necessary to retain the subject in a certain position.

It is quite natural that with the suddenly appearing light-flash the subject will start with a somewhat convulsive motion, which, however, does not interfere with the sharpness of the picture. For such a motion one-fifth of a second is required, the magnesium light flashes up in one-fortieth of a second; the subject moves in one-fifth, equals eight-fortieths of a second, seven-fortieths of a second after the light has appeared, consequently long after the exposure has been made.

Artistic lighting with magnesium light depends upon the relative positions of the light source and reflectors. The power and action of light can be expressed by measures of length and degrees of angles.

Probable time of exposure is not estimated by the eye as in daylight, but is determined upon by weight and measure. A few experiments will show how much magnesium powder is necessary to give a correct exposure at one meter distance with an objective of known focal distance and a plate of known sensitiveness. The quantity required varies between one-half and one gram. Once the required quantity has been found, uniform results will always ensue under the same circumstances. Hence, over or under-exposures are impossible.

The character of a flash-light picture is peculiar. As the subject remains in darkness or at least in very much subdued light a contraction or expansion of the pupils of the eyes can only occur after it has become conscious of the light, that is, after the exposure is over. The expression of the eyes is consequently natural, even of bewitching beauty.

The time of exposure being so extremely short, a change in facial expression can not take place. Owing to the great flood of light pervading the whole of a daylight atelier, it is difficult to obtain plasticity. With magnesium the light-source is so near to, and so directed towards the subject, that the slightest variation in distance or direction shows an immediate and decided action, so that when properly managed the magnesium light results in more plastic photographs, richer in half-tones.

Another and very important advantage of magnesium light is, that exposures can be made with it anywhere; there is no more necessity of ascending to the top floor of a building in search for light.

When I attempt to transfer the young plant but a few months old, the magnesium light, to American ground, I do so with the expectation that it will prosper there. It may, perhaps, take a good while yet before the photographers of the old continent will adopt this new method of lighting. Let us hope, then, Americans will speedily select it for their practical work, to cultivate its advantages and earn benefits from its use.

J. Gaedike.

BERLIN.

DARK-ROOMS FOR PHOTOGRAPHIC CLUBS.

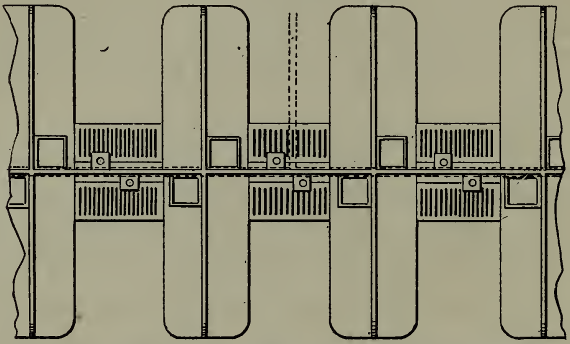
SINCE amateurs in crowded cities are often required to be content with small, close, and unhealthy closets in which to do their work, the providing by a society, or club, of a well-ventilated, convenient, and spacious dark-room for the use of its members becomes an important feature, frequently being the means of attracting new members.

Hence it is that more attention is now being paid to the various little details and conveniences for the dark-room than formerly. Where a number of persons work at the same time in a dark-room, it is important that the carelessness of one shall not injure the work of another. It has been found, by experience, that such is apt to be the case when the sinks are arranged in one row, adjoining each other without any separating division between. The object of the accompanying illustrations is to show a plan by which each person can work separately and independently of the other, without endangering his neighbor's work, and at the same time enjoy the ventilation and light which a spacious room affords.

Supposing a room to be twenty by fifteen feet; a partition six feet high is run lengthwise through the center; along this on each side are placed sinks connected with one waste pipe, and supplied also with one water supply and gas pipe.

At intervals of six feet are upright partitions extending back at right angles to and from the central partition about six feet. Thus a series of six dark-rooms, open at the top and rear, is arranged within the one large room.

FIG. 1.



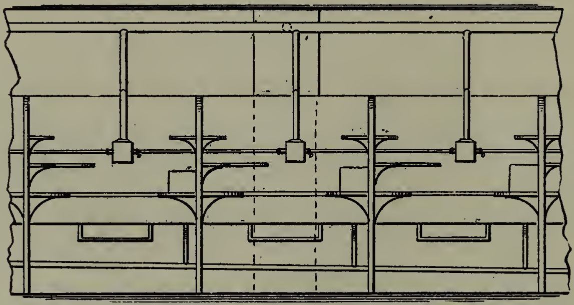


FIG. 2.

Fig. 1 shows a general plan view; fig. 2 a front elevation, and fig. 3 a perspective of the interior of one of these rooms. To the left, on the lower shelf, may be arranged either trays or dipping-baths for the alum and hypo solutions, while the shelves above can be used for holding stock and other solutions, graduates, bottles, etc. On the right-hand shelf, over the sink, is placed the siphon plate-washing box, and to the rear of it is the plate-holder. On the wall above is hung the dusting-brush. A towel is secured to a spring clip depending from the shelf at the rear of the closet, very conveniently located for drying the fingers.

Over the sink is fixed the developing lantern, connected by a pipe to the chimney, and under it is the water faucet; attached underneath the sink is a special rack for holding large trays.

Covering the top of the sink is a sliding grating (see figs. 1, 3 and 4) framed of wood, hinged at the back to a narrow strip, arranged to slide in a groove formed in each edge of the shelf covering the sink. The groove extends only as far as the front side of the sink.

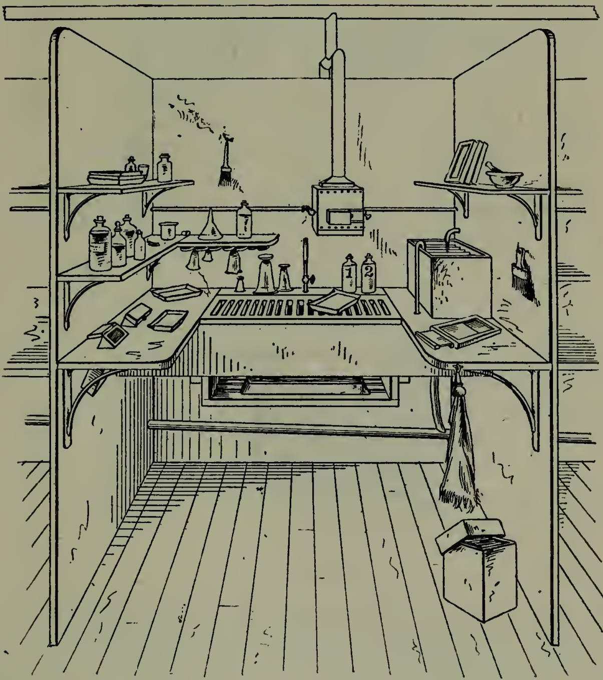


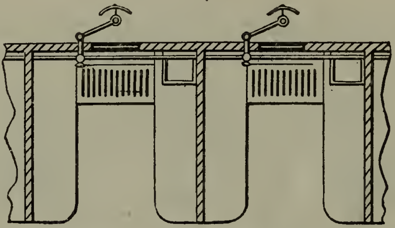
FIG. 3.

The object of this sliding grating is to hold the developing trays, graduates, etc., during the operation of development, but when access to the interior of the sink is desired, as for filling tall bottles, etc., the slatted grating is drawn forward bodily until the narrow strip at the rear reaches the end of the groove in the shelf; then the grating falls in front of the sink and hangs vertically, as shown in fig. 5.

Fig. 4 illustrates a series of stalls arranged along one side of a partition, having the gas-lights fixed on the outside in a separate room, which is certainly an advantage when it is desired to keep the dark-room cool.

The advantage of having additional shelf-room, as provided in the stall system, is one which will be readily appreciated by the active worker. It should be mentioned that the lamps shown have glass at the bottom for permitting the light to pass directly downward upon the tray. Incandescent electric lamps should be used where convenient; next to these, the Wenham gas lamp can be substituted, provided a liberal-sized pipe is arranged to carry off the heat. The sides of the lamp next to the operator should be covered with asbestos to avoid the unpleasant effect of the heat radiating towards the head.

FIG. 4.



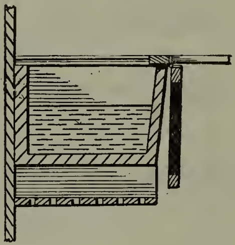


FIG. 5.

F. C. Beach.

NEW YORK.

GENRE PHOTOGRAPHY.

THE works of the Dutch and Flemish painters delight us, because the subjects they have chosen are in the actual and common world about us; from the drama of every-day life, concerning things—

> "Not too bright and good
> For human nature's daily food."

Just such subjects as we would imagine the photographer would seek after, yet genre photography, if we may use the term, has fewer votaries than any other branch of the art.

Story telling by photography is not so difficult, if we have a definite idea of what we are going to tell.

Possessed of the idea, the subject will grow of itself. It will not need any special building up.

The great hindrance to success is the unfortunate possession of the notion that a picture is to be constructed pretty much after the manner of a chair or a table, or something else in which beauty is subservient to utility.

The books which adapt art principles to photography are largely responsible for this belief.

The photographer who starts out with the intention of making a pyramid of his picture, will, most assuredly, succeed in making one, but he will, most assuredly, find his idea buried therein.

But if the idea be the animating force, unity will be the governing principle, all the parts will cohere, and beauty will be evolved by a natural process. For the true laws of art are, after all, only the laws of nature. Nature may have a balance of lines, and may show a predilection for the pyramidal structure in her compositions; but the idea, not the method, must be dominant in the mind of the picture maker.

If the idea is the right one, the method can not help being right also, for the idea will be expressed in terms of Nature's own mathematics.

Be sure you know the rules of art, but be sure never to construct pictures according to rule.

Now the question comes—how can definiteness of pictorial intention be secured? How shall we give a vague idea "a local habitation and a name"? An excellent plan to stimulate the imagination in this respect is to take up a catalogue of pictures or paintings—old sale catalogues, if you can get nothing better, will do—and read over the titles, trying to conceive what the pictures are like. The procurement of a name becomes a sort of nucleus for our ideas. It is surprising how rapidly our conceptions grow under so simple a stimulus.

I suppose it is perfectly lawful to look over the pictures by the old Dutch genre painters and take suggestions here and there, modify, adapt, re-arrange—but it is hardly fair to copy outright, if we afterwards call the subject our own invention.

It is astonishing what pleasing results can be secured by the exercise of our own ingenuity, by calling into service just such common things as are in every-day use.

We will at first have some difficulty in grouping to our taste. The objects manifest their inertia very provokingly at times. They seem not only to be antagonistic to one another, but defiant to the idea which is trying to control them; but by-and-by, as we struggle with them, they yield.

The exercise develops our faculty of seeing things in their relation to one another, so that finally the idea takes more and more definite shape, and it almost seems as if the objects had a previous connection, which some accident had divorced, and we were merely bringing them together again.

The most diverse things will fill in and adapt themselves to one another, and so become real helps to pictorial effect, instead of the hindrances we at first thought them to be.

However, do not crowd too many things in your picture. They will be like factors in an equation—demand a hearing in the summing up.

We have seen pictures of domestic life which looked as if the poor people had gathered together their little all to have a public auction.

Too much detail always detracts from the general interest. It is best to express our ideas in the fewest possible terms consistent with clearness, in photography as well as in writing.

Be sure that everything is in harmony with your scene. A misplaced object, like a false note in music, mars all.

We once knew a worthy photographer who possessed himself of a very beautiful Chinese vase. Because it was beautiful, he delighted to call it into service upon every occasion. Like Bottom, of "Midsummer Night's Dream," it was ready to play any part; but, like the immortal weaver, it too often played the ass for appropriateness.

A picture is never so effective when evenly lighted as when certain portions are thrown into shadow.

The shadow should not be a mere blank of darkness, but broken up by objects, but none of them should be so obtrusive as to attract attention. All the shadows should be quiet and subdued, by which means the perspective of the picture is better secured and the figures have accent or relief without being sharp against the background. Avoid, therefore, in the shadowed parts, those colors which come out brightly upon the sensitive film, even though they are of a natural, subdued tint. The background itself should not be uniformly illuminated. It is best if it gradates from the light side of the picture to the dark part; diagonally, if possible.

This gradation is sometimes secured by making the background run off at a slight angle from the horizontal line of the picture.

The side of the room not represented may be imagined opened, as in many paintings of the Dutch school. The figures should not be so large as to appear cramped for room, nor so small as to look like stage puppets.

Although genre pictures generally represent scenes in ordinary dwelling-rooms, our domestic apartments are usually the worst possible places in which to photograph.

The best light upon the subject is secured by building up an enclosure out-of-doors.

Begin by shutting off entirely the top light by means of boards or canvas; a piece of white paper or muslin will give sufficient top light, if any is needed, but generally there is enough.

A shed adjoining the back buildings is a very convenient place for setting up our little stage.

All that is necessary is to enclose two sides—the background and the side at right angles to it and opposite the principal light.

If we wish to represent three sides of a room, a movable screen should be used, but it should never be so placed as to cut off too much of the principal light. The dominant light may come from any direction, provided it is not direct sunlight.

In the shadowed part of the picture a good many things, ordinarily found in dwelling-rooms, may be simulated by artifices: such objects as would require much trouble and expense to actually produce. For instance, the idea of a fire-place with a mantelpiece above it, may be imitated by putting against the gray background a piece of black cloth of the size and shape of the opening, and placing over it a board covered with a piece of light terra-cotta paper. Objects may be arranged upon this shelf, and a tea-kettle, or pitcher, or some other object associated with a fire-place, placed in front of the sham opening, will heighten in the photograph the illusion.

These objects should be lighter than the dark background, but never so prominent in tone as to attract special attention.

The appearance of a recess, containing books, etc., may be similarly imitated. The books are merely pieces of terra-cotta paper, cut to represent the backs of the covers, laid flat or edgewise, as books are usually arranged.

You will find this terra-cotta paper, light and dark, of the greatest value in imitating objects. It comes in endless rolls, from thirty-six to sixty or more inches in width.

You will soon learn by experience the particular shade any color will take when photographed. Your own devices are a great deal better than the shop accessories, which are generally so profuse in their display of cheap carving, as to look out of place in a domestic scene.

In grouping the figures, you will find it does not look well to have the head of one directly above the other in a perpendicular line, or, where three or more are introduced, to let the heads make any regular-shaped geometric figure, as a square, triangle, or rhombus.

These are rules of art, but they are also rules of good taste, which one possessed of artistic feeling would find out without any recourse to the art books.

Finally, I would like to say something about securing good expression in the countenances of your actors, but I don't know how. I do beseech you, however, to avoid any theatrical simulated passion

The excellency of genre pictures consists in the absence of affected and mawkish sensationalism and stage trickery.

The make-believe can always be told from the real. It is for this reason I delight in H. P. Robinson's pictures, while Reijlander's affect me unpleasantly.

You will generally succeed with children and elderly persons, because their expressions are natural. However, if you have tact and a good humor, you will succeed with anybody.

John Bartlett.

PHILADELPHIA.

SOME THOUGHTS OF AN AMATEUR.

An experience of five years in the ranks of that large and ever-increasing army known as the amateur photographers, may have been productive of some thoughts of interest to the younger members of the fraternity (for I am sensible of the fact that I offer nothing particularly new to the elders), and I beg to present a few of these thoughts through the medium of the ANNUAL.

I think that for *all* photographic work, with the sole exception of architectural subjects, the single achromatic lens offers advantages over the more costly and elaborate doublets. I do not except even portraits from this assertion, as I can show examples taken with a single Darlot which have received unstinted praise from both amateurs and professionals.

In point of quickness, flatness of field, depth of focus, and everything except rectilinearity, I have yet to see any of the expensive 'scopes or 'graphs, whether imported or of domestic manufacture, which excel in any of the above points, a first-class single lens. It is generally thought that a doublet *must* be used for instantaneous work on account of the supposed superiority in point of quickness. But is this a fact? Given the same aperture in two lenses of the same focus, one a single and the other a double combination, would not common sense, and does not experience teach, that rays of light will pass through one piece, or compound of glass, as quickly, or even quicker, than through two?

I think that where the amateur can afford it, he should have at least three lenses. One of very long focus to enable him to secure subjects at a considerable distance, as mountains, objects across a river, etc., a medium focus for ordinary work, and the always useful wide-angle. Let the long focus lens be capable of covering a plate one or two sizes larger than your camera will take, and always use that for shutter work, as it is capable of being worked with a much larger diaphragm than one which just covers the plate. For remember, it is the *amount* of light admitted to the plate rather than its rapidity of entering, that secures you a good instantaneous negative.

I *think* it is folly to use quick plates where it is possible to employ slow ones. Slow plates generally contain more silver than quick ones, and therefore develop easier and quicker and secure more intensity. One or two seconds is not much out of a life-time, and a perfect negative is a very satisfactory thing. Not that perfect negatives *can not* be obtained from quick plates, but I contend that at least 75 per cent more of perfect ones can be realized from the use of a moderately slow plate.

I *think* that I do not believe in any shutter which gives the exposure from the center outwards, and back again in reverse motion. To my mind, the proper opening in any shutter, should be in the form of a triangle, or approximating that shape, with the apex at the top. This, if passed across the face of the lens horizontally, or between the combination, if a doublet, is bound to give the foreground a much longer exposure than the sky, a condition always desirable in instantaneous work.

I *think* that the Detective camera is a somewhat overrated article, and is not destined to come into very general use, especially in cities, for several reasons. First: For a shutter picture one must have light, and plenty of it. This factor in photography is generally seriously lacking in the narrow streets and smoky atmosphere of our large cities. Another reason is, the difficulty of "evening up," especially if your subject is moving rapidly, or you desire to be unobserved in the act. A picture with a background of buildings, the lines of which incline either sideways, or forwards and back, or both, is not particularly pleasing to the eye. I trust I shall be pardoned if I here relate an incident in my experience with my Detective, the solution of which puzzled me not a little, for some time. Some weeks ago at the bicycle races at Lynn, Mass., I snapped my shutter on W. A. Rowe as he was making a mile in 2.37 or thereabouts. On developing, I found I had *him* beautifully, with plenty of definition and sharpness, but to my surprise I saw that a picket fence and the judges' stand behind the rider, were very much blurred. How this could be, with the cyclist going at the speed he was, and yet apparently at rest, was something I could not fathom until after much thought. I decided that, on the moment of exposure, I had involuntarily followed with my camera, which was held loosely in front of me, the motion of the rider, thereby blurring the immovable objects. Had I not done this, I should probably not have got the sharp picture of "Champion Billy" which I did.

I *think*, with every other "photographic crank" in the land, that I have the best developer in existence. It is a modification of one which was published in the *Photographic Times*, in May, 1885, and will accomplish anything that any developer will. Here it is if anybody wants it:

No. 1.

Water	11 ounces.
Sulphite of soda, crystals	4 ounces.
Sulphuric acid, C. P.	½ dram.
Pyro	1 ounce.

No. 2.

Water	11 ounces.
Sulphite of soda	2 ounces.
Carbonate of soda	3 ounces.
Carbonate of potash	1 ounce.

For use, take one dram of pyro solution or No. 1, to three ounces of water, and commencing with fifteen drops of the soda and potash solution or No. 2, work up by ten drop additions, until you get your negative where you want it. Use in this way for *all* exposures, and I think you will like it. Some plates require more of the pyro, particularly extremely rapid ones which are very apt to come out thin. The above formula gives me as good transparencies and lantern slides as it does negatives, and I am never troubled with yellow stains on either from its use. I always use my hypo and alum together for fixing and hardening, as I find it acts much quicker than when used alone. This, I believe, is contrary to the general idea, but such is my experience. However, it can be used but a few times before becoming foul and muddy, and should either be filtered or thrown away.

I *think* that there is an excellent opportunity for some one to make a light, sliding-leg tripod, which shall be *really* rigid, not trembling with every breath of air, or by the uncapping of the lens. I have never seen such a one. I mean one capable of sustaining a 5 by 8 or 6½ by 8½ camera.

I might say something regarding the different printing methods, especially the beautiful bromide process, but I must remember that the entire space of the ANNUAL does not belong to me, so I *think* I will wait until next year.

N. W. Starbird, Jr.

DANVERS, MASS.

RESULTS.

I ONCE asked Professor Morse whether he was not surprised when the wires talked across the ocean. He said he was not, as in his first application to Congress for aid he had said a message could be sent a mile, or the *circumference of the earth.* He had anticipated such a result.

Now, how would good old Father Daguerre feel if he could see the results of his discovery—if the old gentleman could come back in the flesh to this metropolis, and see what is being done by the action of light and chemicals? I should like to have him take my arm, that I might show him around.

First, I would take him to the large stock houses, and show him the elegant apparatus of to-day. How he would open his eyes when his thoughts ran back to his primitive box, with its crude lens. Show him the drop-shutter, and he would think of his thirty minutes' exposure in the sunshine. Tell him of the wonderful instantaneous dry-plate, and he, thinking of his good old Daguerreotype plate, would ask how the silver was hammered on the glass.

Walk with him to one of the first-class galleries, and ask him what he thought of such results, and he would say somebody has been improving on perfection, and then for fear his mind would soar too high, go with him to one of the cheap klub mills, and how his ideas would descend. Then show him the cheap tin-type (50 cents a quart), and he would be dumbfounded, and cling to my arm for support.

Then take him to Coney Island, where clams and the fine arts go hand in hand, let him hear the outside man call out, "Your whole group for 25 cents; put 'em in a bag for you!" he would say, "Let me go back to my grave, 'where the wicked cease from troubling, and the weary are at rest.'"

Before bidding the venerable man good-by, I should say, your discovery has been a great benefit to mankind (and womankind also). It has created a taste for the beautiful, and is appreciated by people of intellect, and in thousands of instances has been a consolation to the bereaved, and gratification to friends separated, perhaps, by continents and oceans. Grieve not because your wonderful discovery has been belittled and abused; it has been a blessing to the world, and the world today could not get along without it.

We still have men, both professional and amateur, who will continue to work for its elevation, until the pinnacle is reached. Go back, keep as quiet as possible, although I well know there is enough to stir up your righteous indignation, yet try to bear it, and when the acme is reached, and we can produce the colors of the rainbow, I will send for you again, and my opinion is, you will have time for a long rest before that desideratum is reached.

Abraham Bogardus.

NEW YORK.

"MY" DEVELOPER.

ONE of the struggling amateur's greatest enemies is his own inconsistency: he thinks it necessary to "try" every new brand of plates or sensitized paper, and every new formula for developing, toning, and other solutions; and thus, butterfly-like, he flits from one flower to another, intoxicating himself with the worthless, and possibly passing unnoticed the sweet, but humble, photographic violet. If he would, on securing a formula capable of producing anything like satisfactory results, stick to it through thick and thin, study it carefully and modify its ingredients to suit his requirements, he would soon find his manipulative difficulties disappear and his work rapidly improve.

Everyone has — or ought to have — a favorite developer. Mine was originally based on Beach's formula, but numerous modifications have rendered it almost unrecognizable as such. Pyrogallic acid is the developer, carbonate of potash the accelerator, and potassium bromide (when necessary) the restrainer;

sodic sulphite prevents the accelerator producing that yellowish-brown discoloration so frequently seen on ammonia and potash developed plates, thus making negatives of first-class printing quality, second only to collodion; it also assists in giving strength and density to the image; the sulphurous acid is employed as a preservative for the pyro in solution. Citric or nitric acid might be substituted for this, but I give it as I have used it, for, as I have always found it satisfactory, I have had no reason for "trying" other oxidation preventives. As all acids act more or less as restrainers, it is unnecessary to use bromide except for cases of over-exposure.

No. 1.—(Pyro Solution).

Warm water (distilled)	8 ounces.
Sulphite of soda	3½ ounces.
Sulphurous acid	3½ ounces.
Pyrogallic acid	1 ounce (avoir).

No. 2.—(Potash Solution).

Water (distilled)	10 ounces.
Carbonate of potash	3 ounces.
Sulphite of soda	2½ ounces.

No. 3.—(Bromide Solution).

Potassium bromide	1 ounce.
Water—fill up to	10 ounces.

No. 1.—Dissolve the sulphite in warm water; when cool, add the two acids. Filter and keep in stoppered bottle.

No. 2.—Is made by dissolving the sulphite in half the water, warm, and doing the same with the potash in the rest of the water, cold. Mix when dissolved.

To develop: to equal quantities of Nos. 1 and 2, add eight times their bulk of water; for example: to develop a 3¼ by 4¼ plate, take water, one ounce; No. 1, thirty minims (one-half dram); No. 2, thirty minims. A few seconds' preliminary soaking in the water and No. 1 only is an advantage, but not essential. The image should commence to appear in a minute or a minute and a half, and should be fully developed in from eight to fifteen minutes. Develop further than is usual with ammonia or ferrous oxalate, as the image seems to lose density to some extent in the fixing-bath.

For over-exposure add from ten to sixty drops No. 3 (bromide) to every ounce of developer.

For under-exposure increase the quantity of No. 2 (potash).

Why I prefer this developer: Because it is reliable and permits of great latitude in exposure if used with a little discretion as an additional ingredient; because it produces clear black and white negatives without any non-actinic veil; because there are no ammonia fumes, and no fear of the alkali losing strength by its bottle being left unstoppered; because it will make a good negative in extreme cases of over or under-exposure where ammonia would be worthless; and because, being a slow developer, it gives the operator time to counteract the slightest error in exposure.

As to the keeping qualities of No. 1, I may say I am at present using a solution made up over nine months since, and, although of a pale claret color, it is quite good and produces perfect negatives.

To the busy professional, on account of its slow action, I can not recommend it; and to those who already work a developer which will do everything possible for a developer to do, I say, stick to it; but to those who are not satisfied with their present formula for whatever reason, I suggest to give this one a fair trial, and I think in future it will be "their" developer.

C. C. Vevers.

LEEDS, ENG.

CARBONATE OF SODA DEVELOPMENT FOR PLATINOTYPES.

SOME time last summer having noticed a communication to the London Photographic Society, that a member had presented some prints made upon old platinum paper, which he developed with a cold solution of carbonate of soda, I determined to try what could be done by the same means with a lot of platinum sensitized paper which I had had on hand for more than a year, and, of course, had given up as totally worthless, circumstances having prevented me from using it within a reasonable time for expecting perfect results. The paper was kept in one of Willis & Clements' tin cases with a supply of the chloride calcium desiccator. Upon opening the case I found the salt completely deliquesced, and, in fact, a syrup-like fluid, which, from careless handling of the case, had become spilled, and had run over and spoiled some of the outer sheets which were cut to 8 by 10 size.

Selecting a half sheet which was not soiled, I placed it beneath a suitable negative in the sun without any preparation and gave it the usual exposure that a silver print would require, and then proceeded to develop with a solution of carbonate soda of the atmospheric temperature. The development of the print was as rapid and as deep in tone as with the prescribed hot solution of potassic oxalate, but I found after repeated trials that it was impossible to get a sharp picture, the reduced platinum black being apparently dissolved and spreading into the whites of the paper, which, aside from this, were pure enough. As the member who reported this process gave no formula or even the strength of the solution he used, I supposed it might be using too strong a bath—consequently, in further trials reduced the stock solution with more and more water. Still I found the same difficulty. I then tried other alkaline solutions—potass. carbonate, and then ammonia, and had no trouble with either in developing a print quite as quickly and perfectly as with the prescribed solution of potassic oxalate at a temperature of 180 deg., with pure and clean whites, but still the same running and staining from the blacks.

I will not take up valuable space by detailing the various experiments I made until I found a remedy for this, but will give the formulæ and manipulations which I found necessary to produce clean, sharp, black prints with perfectly pure whites, and as good as many I have seen made on fresh paper and hot potass. oxalate.

First expose, preferably in the sun, about one-third less time than necessary for a silver print, or about the time required for the Willis development, though this, of course, depends in a great degree upon the character of the negative. Have ready in a shallow pan the following bath:

Saturated solution carbonate soda (washing soda), two ounces, diluted with an equal quantity of water, to which has been added saturated solution of alum, two drams.

The precipitate or cloudiness which results from this addition will do no harm provided it is equally diffused by stirring or shaking. The liquid should have a depth of half an inch in the pan, or even less provided the dish is perfectly level. Have also ready the usual acid solutions (citric or chlorhydric), required in the treatment of platinum prints after development. Then in a moderate light take up the exposed paper by the opposite diagonal corners slightly turned back, and lay it down upon the developer, touching the central portion first, with the same movement as in silvering albumen paper.

Do not let go the corners, but leave the whole surface in contact with the solution for not longer than ten or fifteen seconds; then immediately raise it without sliding or drawing it, taking care that none of the solution wets the back of the paper, which might occasion unequal development. Hold the print before you horizontally and watch the development, which will proceed very rapidly. The fluid on the paper should be allowed to run equally over the whole surface, by inclining the print still held by the corners, or if any part lags let it run toward that part. But the whole thing will occupy but a few seconds, and when the proper depth of color is reached, *immerse* the print in one of the acid baths, leave it for ten minutes, then immerse in second bath for a few minutes, then wash in clear water, but do not put into water till the whites appear pure. In fact all the latter treatment is the same as required by the usual process.

This may seem tedious in description, but is perfectly simple in practice, and the result will be that, no matter how old or damp your platinum paper may have been, you will have a print which will compare favorably with those made under all the care required by the hot oxalate developer, and though, perhaps, not equal in beauty to a fine silver and gold toned print, will afford you a proof with the least possible trouble, and with solutions always at hand, which will be far superior to one made by any other ready method with which I am acquainted.

Quite a range of tones may be secured by a mixture of the soda, potash and ammonia developers, from purple-black to quite a ruddy or warm black. All of the success depends upon the rapid though not hurried manipulation of the print in developing, carefully laying upon the bath, the middle portion touching first to avoid air bells till it is quite flat, then, still holding the upturned corners, raising it straight upwards, and watching the development with the wet side uppermost.

I have specimens made upon paper which would have been absolutely worthless by the prescribed development, and I trust that some of the readers of this will try this process upon fresh paper, for it will certainly be a great advantage to be able to dispense with the hot oxalate process as now prescribed.

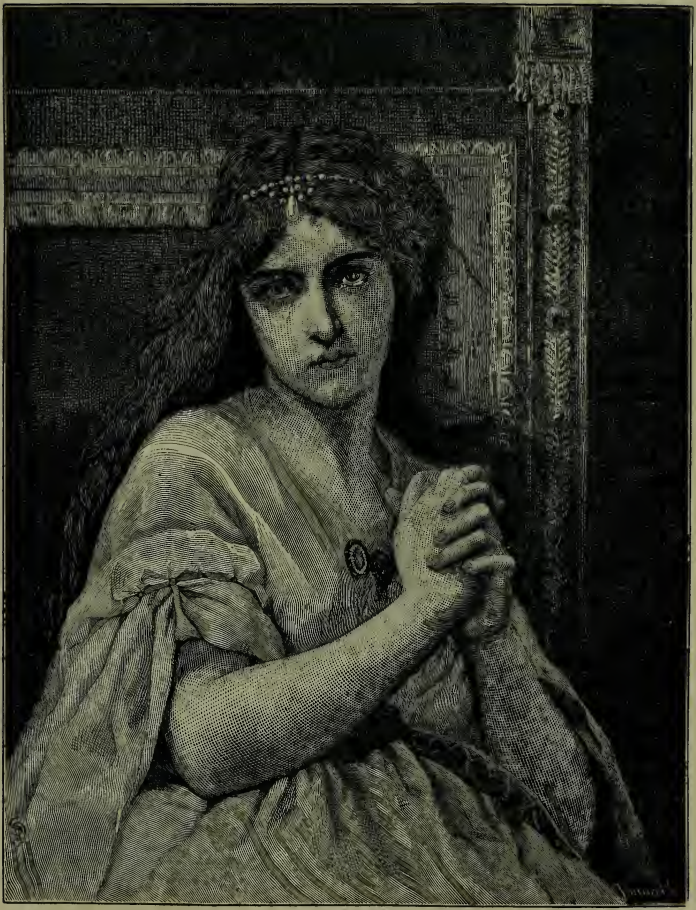
Joseph B. Brown, U. S. A.

ALBION, N. Y.

JAPANESE PAPER FOR PHOTOGRAPHERS.

THE little photography that I have done in Japan has naturally been undertaken under some disadvantages, but not by any means under such difficulties as would be experienced were Japan, as many people imagine, an "uncivilized country."

However, it is not of the manners and customs of the Japanese that I have to write now, but of a purely technical



DESDEMONA.

Engraved by Jounard, from painting by Alex. Cabanel.
Reproduced by Zinc Etching Process by Hugh L. C. Stevens, for AMERICAN ANNUAL OF PHOTOGRAPHY, 1888.

matter. Whatever may be the truth as to improvement or otherwise from the introductions of certain Western customs, there can be no doubt that, to me personally, it is a matter of the greatest convenience that in Tokio there are more than a half dozen "photographic dealers." They are on a very humble scale, certainly, compared with the great American or English establishments; still, if once one gets over the difficulty of the name of what is required, one can get his wants fairly well supplied. One can even get a camera made, and there is one manufacturer of dry-plates in Tokio. He has recently improved his orthography. When I first arrived he styled his goods "Dri-plates."

So I manage to get fairly well all that I want in the way of photographic goods, and there is one thing I have had that is not to be got at home so far as I know, and which is of the greatest convenience for a hundred little things, namely, Japanese paper. Of this I propose to say a few words.

Certain of the finer qualities of Japanese paper are known well enough in both Europe and America. I saw it in use at the wonderful photo-mechanical works of E. Edwards for the finest photo-gravures. This paper is of very great delicacy and finds many uses for artistic purposes, but it is not of it that I propose to speak. It is very little used here, and is very expensive. It is of the paper commonly used by the Japanese for their correspondence that I would speak.

In Japan, as in China, the so-called "pen" is really a paint brush or hair-pencil, brought to a very fine point, and the ink is Chinese ink, rubbed down in water in the common way. The pen is held at the very end, quite perpendicularly to the paper, and in this—to us particularly awkward—style, writing is done in vertical columns, beginning at the right-hand side. For writing with our pen and ink, to obtain a high glaze, rendering the paper as unabsorbent as possible, is the great aim. In the other case the very reverse is the object. The more bibulous the paper the better, and common Japanese paper is more bibulous than our best blotting-paper. Its special virtue lies in this: It is bibulous and is at the same time marvelously tough.

We all know how dreadfully unmanageable blotting-paper becomes when it is very wet. I have chiefly in my mind at present the difficulties I used to have in soaking sheets of blotting-paper in a solution of soda to use for preserving sensitized paper. The toughness of the Japanese paper may be imagined when I say that a strip about an inch wide, rolled tightly up is the ordinary substitute for string here, and that, if the paper be cut in the right direction and be twisted up properly, it is as strong as any but very good string.

The paper is, I am told, made of wood fiber, or, rather, I believe, of the fiber of the inner bark of a tree, but on this point I will not pretend to be certain. It is of a slightly yellow tint, and is very thin. *It is not bleached or treated in any way with chemicals*, being either sun bleached or not bleached at all. It may, therefore, be looked upon as chemically pure, and might probably be used with safety (if first thoroughly dried) for placing between plates. Of this I shall have something to say in the *Photographic Times* after I have tried the experiment. Meantime, I use it for so many little purposes that I should feel the loss of it very much.

Thus its toughness and smoothness are such that, if I want to dry a negative quickly, I have no hesitation in placing the paper directly on the surface of the film and blotting it up. This is a thing that it is always a risk to do with blotting-paper. Then, in using it for blotting off the silver solution from sensitized paper, I have no fear that I am possibly using a paper impregnated with hyposulphite, used as an "anti-chlor." The same applies to the drying of the paper after it is printed. I have already indicated its use in preparing soda saturated sheets for preserving sensitized paper. Then the softness, combined with toughness, makes the article infinitely more convenient and more efficient for wrapping up negatives or, in fact, almost anything else. Envelopes are made of it, of all sizes and of relative width and breadth, almost precisely corresponding to the ordinary sizes of plates. These envelopes might have been made purposely for the storage of negatives.

A coarser form of the paper is substituted for a cloth which soon becomes so dirty that it is liable to make the last state of anything wiped with it worse than the first. A pile of the paper is kept in a place where it is accessible and, for wiping a dish or the hands, a sheet is taken and is then thrown away.

The paper I write of is, then, light and transparent. It is the kind used in place of glass for all Japanese windows—which consist of a wooden frame with lattice work, having paper stretched over it, the whole opening by sliding to one side—and the size of sheet is about 13 by 10. This precisely suits the size I work—12 by 10 plates, from which I commonly take prints about 11½ by 8 or 9 inches. The paper can, however, I believe, be got in larger sizes. The price is something wonderfully small; I really can not tell precisely what, but I know I get quite a thick pile of it for twenty-five cents.

Of the finer paper I do not give any description, as it is fairly well known already in Western countries, but I intend to try if I can not work out a good plain silver-printing process on it. The results would, I believe, be very beautiful. It seems to me also that it would be particularly well suited to the platinotype process.

As regards the commoner kind of paper, of which I have been writing, I imagine it would be very well worth the while of a photographic stock dealer to take up the sale of it.

W. K. Burton.

IMPERIAL UNIVERSITY, TOKIO, Japan.

THE ARGENTOMETER FOR CONTROLLING SILVER BATHS.

As is well-known, an argentometer marking "10" signifies that the silver bath contains ten parts of water to one part nitrate of silver.

This is quite correct, if the solution to be examined only contains silver nitrate; it is however, wrong, if, as is the case with every silver bath which has been already used, it contains also alkaline nitrates.

The argentometer scale simply, then, denotes a figure which can be reckoned into specific gravity; so, for instance, the argentometer indicating at "10," according to specific gravity is 1·093.

If, for instance, a paper salted with chloride of sodium had been used, the silver bath would chiefly have been a solution of silver nitrate and nitrate of soda.

The argentometer figure of "10" can then signify the state of a number of different mixtures of these two salts of which some following are given.

Argentometer reading "10," can be got through the following solutions:

10	per cent	nitrate of	silver	and	0	per cent	nitrate of	soda.
9	"	"	"	"	1·5	"	"	"
8	"	"	"	"	3·0	"	"	"
7	"	"	"	"	4·5	"	"	"
6	"	"	"	"	6·0	"	"	"
5	"	"	"	"	7·5	"	"	"
4	"	"	"	"	9·0	"	"	"
3	"	"	"	"	10·4	"	"	"
2	"	"	"	"	11·9	"	"	"
1	"	"	"	"	13·4	"	"	"

The following table shows the specific gravity and the required percentage of silver nitrate, potash, soda, and ammonia-nitrate, if these four salts are in a complete solution.

To the quantity of silver solution with nitrate alkali can be added (as no important contraction has to be proved) the specific gravity (viz., the plus over 1).

Table for Comparison of Argentometer Readings, the Specific Gravity and the Percentage of the Different Nitrate Salts which Appear in the Silver Baths.

		Contents in Percentage of Nitrate Salts.			
Argentometer.	Spec. Grav.	Silver.	Potash.	Soda.	Ammoniac.
	1·009	1·0	1·4	1·5	2·0
	1.018	2·0	2·9	3·0	4·0
	1·027	3·0	4·3	4·5	6·0
	1·036	4·0	5·8	6·0	8·0
20	1·046	5·0	7·2	7·5	10·0
18	1·051	5·55	8 0	8·3	12·7
16	1·058	6·25	9·0	9·4	14·5
15	1·062	6·67	9·5	10·0	15·5
14	1·067	7·14	10·3	10·7	16·5
13	1·073	7·70	11·1	11·6	18·2
12	1·078	8·33	12·0	12·6	19·5
11	1·085	9·10	12·9	13·8	21·0
10	1·093	10·00	14·0	15·0	24 0
9	1·103	11·10	15·4	17·0	27·0
8	1·116	12·50	17·2	19·5	31·0
7	1·133	14·30	19·8	23·0	37·0
6	1·155	16·67	22·7	26·2	44·0
5	1·186	20·00	27·0	31·0	54·0

A silver bath, therefore, containing, besides ten per cent of silver, also ten per cent nitrate of soda, would give the specific gravity of 1·093 + ·062 = 1·155; that is, argentometer reading "6."

No more need be said about the usefulness of the argentometer for controlling silver baths.

The only method giving exact results, viz., through volumetrical analysis, is unfortunately but seldom adopted, as few practitioners have taken to it.

Volumetrical analysis (if one has once begun with it) is, however, not at all difficult.

Dr. E. A. Just.

VIENNA.

WHY STUDY ART?

There is a great deal of dumb-art business going on in these æsthetic times. I am almost afraid to say anything about it lest the good fellows who desire to become artists grow depressed and discouraged and give up trying.

But they may as well know that there is a *right* way and be led to follow therein; so I will not hesitate to sound the alarm. Photographers should not attempt a story-picture—one that is meant to tell something, until they understand fully the rules which should direct them in the work. These rules are not inflexible, but they are real, and they are exceedingly helpful. They not only pertain to the light and shade, but likewise to the interior and exterior lines, to their balance and to their relation to each other, as well as to the arrangement of the accessories. I do not propose to go into the depths here. I only desire to mention the importance of learning how to spell in art before you try to *read.* Burnet's "Education of the Eye"; Burnet's "Hints on Composition," and Burnet's "Light and Shade" have influenced me in my study of art-principles more than any other works, and I commend them to every earnest student. If you will digest them you will go right whenever you study a picture, or whenever you try to make one, in spite of yourself. You will be swayed by them and will yield to them more readily than you would to a mesmerist or to a mind-reader.

This brings me to my text— *Why Study Art?* The answer to the photographer is, that you may enjoy the pleasure it affords, and that you may impart more pleasure to your patrons by means of the productions of your camera. "And is it only because art is a pleasure," I hear one say, "that we pursue it?" Exactly. Pleasure is all we live for—all we strive for—pleasure *is* living in the highest sense. The faculty of artistic sight and the ability to understand the productions of art, create the most refined pleasure of which man is capable. There is the whole thing in a chestnut-burr. The man who is the most of an artist, surely gets the most true enjoyment out of what he sees. "All the world's a"—picture to him, and wherever, whichever way he looks, the elements of things about him form pictures for him—things seem to run together for him just as promptly as the molecules of silver in the film respond to the touch of the developer, and run, leap, fly! to their places, in order to build up the lovely image. The street, the church, the museum, his home, the train, the art gallery, alike hold the latent images. He is the developing agent; he applies *himself*, and pictures are produced for him wherever he looks. A suicidal-looking Spaniard, attendant upon a corner peanut stand, poses and wraps his long cloak about him for our artist in a way he would not for anyone else, and all unconsciously. The old man in the park with one foot drawn up into his boot-leg to rest it, poses on the bench, and drops his satchel by his side, in just such a way as to attract and direct our artist. The picture lover gets the *best* always from whatever he sees. If such an advantage is his, and he is a photographer, he is enabled also to pleasurably impress his patrons by the pictures he produces for them and to win their dollars and their praise. He imparts of himself—his work partakes of his individuality. The *art* that is *in* him COMES OUT. I could no more explain further what it is, than I can answer the queries which come to me almost daily: "What exposure should I give for a view?" or "How strong should the developer be for an interior?" All these things are matters of inspiration. And you should study art so you can become more and more inspired.

Edward L. Wilson.

NEW YORK.

PHOTOGRAPHING IN THE ARCTIC.

WITH photographing as simple, inexpensive and easily learned as it is to day, there can be no excuse for publishing a book, particularly on travel, that is not accurately and thoroughly illustrated. Words can not do justice to some subjects, neither can the pencil, particularly in pictures where living objects are concerned, without the aid of the camera. The camera can not lie.

If some one were to ask me what to take in preparing for a trip to the Arctic, my first impulse would be to say: "Either take to drink, or take your life."

But after all, to a young man who is willing to put up with all sorts of conditions and circumstances, such a trip is enjoyable. I certainly found it exceedingly so. But I was fortunate in the choice of a year. In the last quarter of a century such perfect weather has not been conceived of as was experienced there the past season.

The newspaper man has always had the reputation for being ubiquitous. Of late, however, the amateur photographer has kept him company. Yet both seem to have slighted the Arctic where the whalemen have been every year since 1848.

Representing both these individuals, the deed was done in partnership, so one was not more "ubiquitous" than the other.

The pictures I got surpass my expectations. It may be purely accidental that they are so uniformly good; but however that may be, perhaps in my experience will be hidden a hint for some other amateur contemplating a similar trip.

First of all, let me urge the use of a detective camera. Considering the nature of the work to be done, nothing can equal it. Mine is Scovill's 4 by 5. For plates I provided twenty-eight boxes of Carbutt's extra instantaneous and 68 rolls of American films. The plates worked perfectly, yet there are times when glass is too bulky and clumsy of use. Paper negatives never gave me satisfaction, but what was lacking in them is made good in the films. With them I have got pictures that I could not possibly otherwise have obtained. They open a new era in outdoor photography. But the holder, in my experience, is not yet such a complete success.

One afternoon a whale was struck a short distance from the ship, and not instantly killed. The captain very kindly ran the vessel, a steamer, nearer. While standing in the bow I coiled off picture after picture of that whale's gymnastics. Had I only had glass to depend upon, he might have poked his huge head out of the water time after time, and flourished his flukes in defiance while I was changing plate holders. As it was I can say that he died game, and my films will prove it. Under somewhat similar circumstances my films got the best of a polar bear and her cub.

When natives were aboard, also, films were a necessity. Perhaps several canoe loads would come off. They would walk about, while I, sitting in some convenient spot, with my Scovill on my knee, would reel them off one after another in a way that no other camera or plates could. Had it been necessary to change plates after every "shot," or refocus each time, some of my best pictures would still be untaken.

A good illustration of the needs of the case was my experience at Indian Point. A native named Gohára living there is by far the smartest trader on the Asiatic shore, and as he plays an itmportant part in the whaleman's cruise, my book would not be complete without his picture. Accordingly I asked him to let me photograph him, but he refused on the ground that "You take him (the picture) some other place, California, then Gohára die. He go, too." That is, in taking his picture, I would take the spirit of life from him, so that he would die, and it would always be necessary for him to remain by the picture. Wherever that went he would have to follow. Argument was useless, so I turned away, went forward, sat down on the carpenter's bench, and in less than a quarter of an hour had three as good pictures of him as I could have asked for.

With children, also, it was necessary to steal their likenesses. When the natives found that the camera was not a doctor's medicine chest, they imagined that the white man's devil was stowed away in it, and by pointing it at the children I would bewitch them. No one can imagine in what terror these Esquimaux are of the devil.

Some natives there and on the American shore comprehended what the camera was, but in instances where they consented to be photographed, the results were not as satisfactory as in the "stolen" ones.

Undoubtedly I was more lavish with plates than was necessary, but such a trip is an event of a lifetime. Films take up but little space, and one can afford some extravagance under such circumstances.

The settlement at Point Barrow is on the extreme northern tip of the American continent, beyond the reach of cameras and "sich." Who would not take advantage of such an opportunity? I loaded up both roll-holders, and by the time I had seen the sights, I had nearly the whole settlement in them.

In some cases, glass plates seemed better adapted. Thus on July 19th, I stood watch for the midnight sun. The conditions were very happy. In the foreground were two or three ships, and just enough swell was on to make a delicate sheen. I wonder how many amateurs have photographed the sun at midnight?

I have returned home with about seven hundred negatives, three-fifths of them films. Whales, dead and alive, figure in over 100. As many more are of ships under all conditions of sail, or at anchor. The rest are of whalemen, ice floes, prominent land-marks, natives, etc., etc.

Were I to make another such trip, I would take about the same supply of glass plates in proportion to films, if space allowed; a goodly supply of developer, a dozen hard rubber developing trays, an extra lens, and developing apparatus, including a drying frame. The facilities for working on ship board are very limited, owing to the necessity of economizing in water, consequently little or no printing could be done. Occasional developing, however, is necessary to test the strength of the light. I washed my plates in salt water, then rinsed thoroughly in fresh, and the results appear to be satisfactory.

My tripod was used twice, and I regret it both times, for better pictures could have been obtained without it.

I can not believe that the equipment for such a trip could be complete without a detective camera. Not only is it necessary as I have already shown, but it affords lots of amusement. When a few days out from San Francisco, I “shot” our pod-bellied cooper, and after that he would conceal himself whenever the “black ditty box” (as he called the camera) appeared. The natives mistook it for a medicine chest, and would call out “doghter”; then rub their stomachs to keep the imaginary cramps down. Sailors called it a “rat-trap” from its resemblance to the old-fashioned article of that kind which was open at both ends; the masters and officers who did not know, or recall, my name, called me that fellow with the “flicker” or “snapping machine.”

One beautiful day the last week in July we lay off Icy Cape. Natives were aboard, and one of the head officers, who had been pacing the deck, sat down by the side of an old settler.

“Mr. Blank,” said I.

He and the native looked up at the same instant.

“Click” went the camera.

“Thank you,” said I, as I turned to go below, but I heard him say with a slight touch of the brogue:

“That damned rascal.”

From that time this name clung to the camera with all on board that vessel.

Many such laughable instances occurred, and the best pictures resulted from them, for there was nothing “set.”

My developer, recommended by the editor of the *Photographic Times*, was so easily mixed, and did such good work, that I give the formula. For films it needs to be renewed for every second or third picture, but excellent results were obtained by allowing glass plates to remain for some time in developer that had just been used for preceding plates.

A.

Water	2 ounces.
Carbonate soda	2 level teaspoonfuls.
Carbonate potash	2 “ “

B.

Water	½ ounce.
Pyrogallic acid	1 level teaspoonful.

C.

Water	1 ounce.
Bromide potassium	50 grains.

To 2 ounces of water, add 1½ drams of B to 1 dram of A, and 1 drop of C.

Not knowing anything of San Francisco, I purchased all my supplies in the East, but when I arrived there I found that Mr. Partridge could have supplied to as good advantage, particularly in bulky articles. This is an important consideration, for the charge for extra baggage in going overland may be a large item.

Herbert L. Aldrich.

SPRINGFIELD, MASS.

PHOTO-COPPER-PLATE PRINTING, AND STEEL-FACING OF ETCHED COPPER-PLATES.

DURING the last few years no more particular attention has been directed to any of the novelties in photography, than to those regarding reproductions. A number of eminent and experienced authorities have endeavored to utilize and apply photography to the reproductions of beautiful works of art and nature, uniting simplicity in operation with sterling results. At the outset we must discriminate in that respect between methods, by which but a certain class of cheap book illustrations are made, and others whose just claim and purpose it is to execute work of artistic merit. For the former the ordinary type printing press will always be sufficient, while for the purpose of others copper-plate printing offers now the most favorable method. These processes are widely known by the name of heliogravure or photo-gravure; the modes of working them differs, however, widely from others.

The making of heliogravures, by the methods practiced heretofore is defective in two principal points. First, the picture has to undergo far too many revisions and transfers before it can appear upon the copper-plate in relief or intaglio. A negative copy must be made of the original first; from it a diapositive, which after being printed upon pigment paper, is transferred upon the copper-plate, when the etching is done with perchloride of iron, or reproduced in relief by galvanoplastic processes. Either of these manipulations injures sharpness, and destroys half-tones so much, that a finished plate is far from being equal in sharpness and modulation to that of the original plate. Whatever has thus been lost must be restored by retouching with the roulette, needle, or burnishing steel.

Secondly, success in etching is mere accident. The process of etching is very difficult to control; correct depth in light and shade, owing to insurmountable difficulties, depends more or less on mere guess work. By noticing the following remarks, photo-copper-plate printing will appear in quite a different light.

It can not very well be expected that the limits of this article will allow a description of the whole process in all its details, but it will suffice to describe it sufficiently to show how much it differs from other methods.

To prepare a photo-copper-plate, a negative is first taken from the original, transformed into a chloride of silver positive, and brought in close contact with an absolutely plane and bright copper-plate. Corresponding to the intensity of the silver deposit of the original negative, chloride of silver rests now upon the copper-plate, more of it in the vigorous or darker parts, less in the light. By a simple galvano-chemical process the chloride of silver decomposes, forming metallic silver and soluble chloride of copper, produces depths where chloride of silver abounded in a high degree, and less so where it had been to a limited extent. The quantity of chloride of silver present establishes thus the proportionate lights and shades, which effects depend with the old process solely upon the more or less correct judgment of the etcher.

Another and very important advantage is the short time required to make a plate. While with the other method it took weeks to do so, we can now make a photo-copper-plate ready to go to press within two days, provided there were no faults in the original negative.

Furthermore, these plates are suitable to print large editions from. As large a number as 21,000 have been printed successfully from one plate, which has remained perfectly intact, having suffered no injury whatever.

With such large editions the plate should naturally be repeatedly steel-faced, an operation of main importance and requiring extreme care. Whenever the depths of a plate begin to show red, that is when the steel face first applied wears off, it is absolutely necessary to interrupt printing, and to remove the steel. It is, however, permissible to apply a second steel plating over the first, an operation which on account of the possible loss of sharpness, should be done but once. It is always better to remove the first steel plating entirely, easily done with dilute sulphuric acid, when a new coat of steel can be given.

A steel-faced plate should allow from 2000 to 3000 proofs to be pulled off, a result easily attained with a uniform electric current with intelligent workmanship, and properly prepared solutions. Reliable and even-proportioned solutions and correctly executed manipulation will never fail to secure, without any great difficulties, the desired results.

The following very simple methods have given invariably good results during the last two years. The plate is to be well cleansed from adhering printer's ink, with chloroform or spirits of turpentine, and thoroughly washed with a stiff bristle brush and a solution of caustic potash or cyanide of potassium 1 : 20. When perfectly bright and clean the plate is placed in a porcelain tray, on the bottom of which rests a brightly burnished copper wire, the negative pole. To prevent any possible oxidation the plating solution is at once poured in the tray. The anode on the positive pole, a bright steel plate, is suspended over the copper-plate and kept in motion while the circuit is closed. A precipitate of steel, resembling silver in its appearance, must instantly occur upon the copper-plate, any air-bells forming upon the plate to be removed. It requires about five minutes to deposit a perfect steel coating. It is essential to compound the solution after the following formula:

Distilled water..................................	1 liter.
Chloride of ammonium..........................	60 grams.
Protosulphate of Iron....	30 grams.
Iron alum (Ka O, $SO_3 + Fe_2O_3, {}_3SO_3$ + 24 aq.)..	30 grams.

After two day's standing and before use, the solution must be filtered twice, an operation to be repeated every time the solution is employed.

After the plate has been steel-faced it must be cleansed as heretofore, and to prevent oxidation rubbed with a greased rag.

The above method works well and gives uniformly good results.

E. Obernetter.

MUNICH.

MIXING AN EMULSION WITH AMMONIA.

Although the following method of mixing an emulsion has been frequently recommended when it is to be made sensitive by boiling, I have never seen any record of its being used in the cold process, where ammonia is the sensitizing agent. The results are so peculiar, and have been so satisfactory with me, that it may interest some other experimental emulsionist to try it. Take any good formula; the following proportions are well suited to the method:

Nelson's No. 1 gelatine	20 grains.
Bromide of ammonium	70 grains.
Pure water	2 ounces.

Dissolve as usual, and cool to seventy-five deg. Fahr.; then add three drams of pure 95 per cent alcohol. After stirring, add about one and one half drams of concentrated ammonia. The exact amount can be determined by dissolving a definite amount of nitrate of silver, say fifty grains in one ounce of water, and measuring the quantity of any sample of ammonia required to just re-dissolve the precipitate. The necessary quantity can then be calculated from this standard by making it proportional to the weight of silver crystals used. After adding the ammonia, mix thoroughly, and immediately put in one hundred grains of dry nitrate of silver crystals. Shake or stir rapidly until a complete solution is effected, which will be in two or three minutes. Place in a water bath, and maintain an even temperature of one hundred deg. Fahr. for thirty to sixty minutes, according to the rapidity desired, stirring the emulsion at intervals of eight or ten minutes. A drop of the freshly-mixed emulsion put into a glass beaker containing two or three ounces of water, imparts to it a beautiful ruby color by transmitted light, which gradually becomes changed during the process of digestion to an orange, then yellow, and finally presents a strong tinge of violet, with a remaining trace of yellow. The latter stage gives great rapidity to the plate. It will develop to good density, though rather slowly, and shows more detail in the shadows, with short exposures, than many of the extra rapid commercial plates. After the desired rapidity has been gained, add to the emulsion forty-five grains of hard gelatine, which has been dissolved in six drams of water, and cooled to one hundred deg. Fahr., mix thoroughly, cool to a stiff jelly, break up into shreds, and wash as usual. After draining, add thirty-five grains Nelson's No.

1 gelatine; melt, add two drams pure alcohol, filter, and proceed to coat the plates. I have had better success with this emulsion to coat the plates the same day, as it gains nothing by keeping, and in some cases has lost in rapidity. I know that many of the published methods do not prove equally successful in the hands of different workers, but this has given good results with me, and I hope others will try it.

Samuel Wadsworth.

KEENE, N. H.

TANNIN PLATES FOR LANTERN SLIDES.

How is it that the collodion process is so little used in the production of lantern slides by amateurs? The beauty of the results so produced does not fail to strike all observers; yet I believe that the majority of amateur lantern-slide makers produce their work on gelatino-bromide, a smaller but more successful section uses gelatino-chloride, or chloro-bromide, and a few here and there only use collodion. (Those who use albumen or carbon, form a smaller class still.) I have used the whole of the recognized methods of making transparencies; wet plates pure and simple I prefer for some purposes, and with a certain class of negative; collodion emulsion leaves little or nothing to be desired, if properly managed, though the tone of the average emulsion plate is objected to by many, but for general work and for certainty I settled down some years ago to dry bath plates with a tannin, beer, or coffee preservative. The first named of the three I almost always use, and to all who understand the silver bath, I would highly recommend it. Of course there is the inevitable condition which is found in cases of this sort—a knowledge of a portion at least of the wet process is an essential. But why should not every amateur practice collodion? For my part, and taking for granted that an amateur is one who practices photography for the love of it, I think that every amateur should take a pride in making himself acquainted with as many different processes as he can, for he will always find that one of them enables him to do work which is difficult, if not impossible, of attainment with others, and if he has not the inclination to work, and soil his delicate fingers with silver—even though he would improve his results by so doing—then I maintain he is no more worthy the name of "Amateur Photographer," than the enterprising individual who buys a gun and ammunition, and then gives a boy a shilling or a few cents for a trapped rabbit is worthy the title of "Sportsman."

The experience gained in making negatives on "tannin plates" enables one to take up transparency making upon them without difficulty; but those who have had no previous experience with them will perhaps have slight failures at the commencement.

The solutions required are the ordinary silver bath used for wet plates, consisting of a 35-grain solution of nitrate of silver, in distilled water, a solution of tannin, and the developer of pyro and citric acid, with a 10-grain solution of silver. The mode of procedure used by myself is as follows: I first of all run a corrundum file or emery stick along the face of the plates so as to grind it to a distance of about one-sixteenth of an inch in from the edge—do this on all four sides of the face which you intend to collodionize; it is essential that either this treatment or a substratum be employed, as in common with all dry collodion films these exhibit, after fixation, a tendency to leave the glass which surpasses the frilling propensities of gelatine. Personally I prefer the ground edges to a substratum, as not only does this method not cause injury to the silver bath, but in the event of failures the plates are easily cleaned, and can be used again without further preparation.

After the edges are filed down (and a dozen can be done in ten minutes) the plates are well washed to remove any powdered emery that may adhere to them, then cleaned with dilute nitric acid, polished, and placed in a grooved box for use. When ready for work dust the plate, collodionize and sensitize in the usual manner as for wet plates; on removal from the bath plunge the plate into a dish of distilled water and leave it there whilst coating and immersing another plate in the silver solution, then take the first plate and wash for 30 or 40 seconds under the tap, flow over it a 10 or 15-grain solution of tannin, filtered, pour off, and stand the plate up to dry, prepared side towards the wall; then lift the second plate and place in the same distilled water (which may be about 4 ounces) whilst preparing a third, and so on. Twelve may be easily made in an hour.

The printing may be either by contact or in the camera, and in either case daylight is preferable; the exposures by artificial light (gas or kerosene) are very long. Under a medium gelatine negative in a printing frame an exposure of, say six seconds, to diffused daylight in summer, when the sun is shining and there are cumulus clouds about, is an average—that is if the negative is of good color; under a good collodion negative one or two seconds will be found enough. Bring into the dark room and well wash under the tap, so as to thoroughly saturate the film, taking care not to use too much force, then flow over the plate the developer, consisting of a solution of two grains of pyrogallol and one of citric acid in one ounce of water, pour as much into the developing cup as is necessary to well cover the plate and flow it over, return it to the cup, and add one or two drops of a 10-grain solution of silver, and the image will develop almost as quickly as a wet plate; it should make a start in from five to eight seconds. When all details are out the image will most likely be so thin as to be scarcely visible by transmitted light, then add two or three drops more of the 10-grain solution of silver, and if necessary a little more of the acid pyro solution, the transparency will be found to grow gradually in strength, and in about a minute it will be of full density; this may be most accurately judged by holding it up to the yellow light of the window, especially if the yellow medium be translucent instead of transparent, as contrary to what obtains with a gelatine film, the density is not reduced in the fixing bath; when of proper density wash well, though still with a gentle stream—for the collodion film, tender to begin with, is rendered much more so after treatment with the pyro—and fix in hypo; strength not material, so long as it is strong enough to clear the plate in a minute or two, then wash most carefully under the tap, employing a gentle stream for three or four minutes, and rear up to dry. When dry, if your negative was a good one, the operations carefully performed, and the letter of instructions adhered to, you should have a transparency fit to exibit to any audience. Of course a few failures must be expected to start with, but you will soon get into the groove and be able to turn out transparencies at an expenditure of time and money which will leave gelatino-chloride in the back-ground; the plates do not cost near as much to prepare as the chloride do to buy, do not require the same amount of washing after fixation, as the collodion will not hold the hypo like gelatine does, and there is no danger of reducing the strength of the image by leaving too long in the fixing bath, as is the case of gelatino-chloride. Apropos of the latter remark I know of some slides which, twelve months after making, had faded so completely that they were not fit to look at; they had been made on pure chloride plates, and the maker had removed them from the fixing bath before they were completely fixed (although they appeared to be so—and were actually shown several times in the lantern without any defect being apparent) as the picture was reducing under the hypo to an extent which frightened him.

SOLUTIONS, ETC.

Use any good bromo-iodized collodion.

Sensitize in silver bath, 35 grains to the ounce.

After washing use 10 or 15-grain solution of tannin.

Develop with pyro 2 grains, citric acid 1 grain, water 1 ounce.

Fix in hypo. The slides are better without varnishing. Varnish reduces the density somewhat, and often introduces dust, etc.

REMARKS.

Great latitude in the strength of the tannin solution is allowable; a strong solution produces much vigor and great richness of tone, but slightly lowers the sensitiveness. The strength before recommended is a good working one, and one which will under all circumstances yield satisfactory results.

The acid-pyro solution will keep for weeks.

The color depends to a great extent upon the exposure, ranging from bright yellowish brown, through dark brown, and rich juicy purple to black; though as a rule where the light brown tone shows after fixing, it may be taken for granted that there has been over-exposure, and where the color is black the plate has generally been verging on under-exposure. A correct exposure from a good negative will give a color similar to a well and brilliantly toned albumen print.

It may not be out of place to again mention that great care must be used in all the washings after exposure, in consequence of the exceedingly tender nature of the film.

One thing more I would guard beginners against, and that is the quality of the water used for the washing of the plate after sensitizing. I had worked the process very successfully for negative making in one of the Australian cities; on going for a short stay to another I attempted it, and could not get a single good negative, until it struck me that the water was at fault. I tried distilled water all round, not using the tap water for anything but the final washing after fixing, and the resulting batch of plates was first-class.

I think that any amateur taking up this branch will be more than satisfied with the results, and the ease with which they are obtained, and if any difficulties arise there are numbers of "old school" photographers in the States who understand the working of the process (I know this from perusal of the photo. journals years ago), and who would, I am certain, willingly help any benighted individual, and if the result of my calling attention to the process should be that only one good slide maker embraces it, I will not consider these lines written in vain.

J. H. Harvey.

MELBOURNE, Australia.

SILVER PRINTING.—AN AMATEUR'S EXPERIENCE.

IN the year 1882 I purchased my first camera, and from that time to the present have been up to my neck in all sorts of difficulties in my endeavor to produce a record, photographically speaking, of scenes that have pleased my fancy and had in them elements of beauty sufficient to inspire the wish to preserve them. In the hope that some poor struggler may be benefited, I will put down in the briefest possible manner some things I have learned by experience and otherwise, about printing and toning, claiming nothing new or original, and with the feeling that probably what I have to say has already been said over and over again by far abler and more competent writers.

It took me a long time to learn to print and tone. I have produced all tones, and in the beginning got everything but good ones. I have now been settled on a good working basis for two years or more, reaching results that are quite satisfactory, and if any beginner who sees this article will follow directions implicitly, I think he will have a fair measure of success, and once the routine is established, will go steadily on improving with each batch of prints.

I sensitize my own paper (floating it three minutes on a bath made up fifty grains to the ounce, neutralized with ammonia if the least bit acid), fume twenty minutes to half an hour, cut to the desired size, and put it into an empty negative box with a clean piece of glass on top to keep the paper from curling.

Clean the back of the negative and dust off the front or film side very gently, and put it into the printing frame after covering the front side of printing frame with white tissue paper.

Print until the detail in shadows has nearly disappeared and the high-lights are somewhat tinted, then remove the paper from the frame and place in light-tight box or drawer until all prints are made.

To wash the prints take a large pan and fill with water. Place prints in face down. They will probably curl tightly, but as soon as they become soaked will straighten out. Wash in two or three changes of water for, say ten minutes, or until the toning bath is made and ready for use.

To make the toning bath, put a fifteen-grain bottle of C. P. chloride of gold into seven and a half ounces of water. This gives a stock solution of gold having one grain to each half ounce of solution used. Take half an ounce of gold stock solution. Into the toning pan or a graduate drop a small piece of blue litmus paper. Pour upon this litmus paper the half ounce of gold solution. The litmus paper instantly turns a bright red. Drop into the gold solution enough of a solution of bicarbonate of soda and water (say a tablespoonful of bicarbonate of soda to half a pint of water), to turn the litmus paper back to its original color, that is, quite a decided blue. Add eight ounces of water, a pinch of salt, stir with the hand to mix thoroughly, and the bath is made. One grain of gold will tone a sheet of paper 18 by 22.

To tone, take from the washing water about a dozen prints, one at a time, and place them face down in the toning bath. Turn them over and over, always taking from the bottom, until they assume a slightly bluish color in the whites, and have rather more of a bluish tinge than you wish them to have when finished. I always tone by gaslight, and by holding a print up before the light can easily tell if the red color is about gone. Tone until the red is all out of the whites, and only shows in the deepest shadows when viewed by holding the print up before the light. As you look down upon the prints in the toning bath they often have the appearance of being fully toned when they are nowhere near done, and I find it impossible to to tell while in the toning bath whether they are done or not. It is recommended by some never to judge of a print by holding it up to the light, but if one is desirous of being very sure of getting a certain color, there is no better way that I know of than to hold it up and look through it. When there is no red to be seen in the print except in the shadows, it is toned, and should at once be removed from the toning bath. If the finished prints are desired rather warm in color, do not take out too much of the red in the shadows.

Have a weak bath of salt and water, say a tablespoonful of salt to a quart of water, and place the prints in this on taking them from the toning bath, face down. Continue in this way until all the prints are toned.

If they appear to tone slowly after a number have been toned, take another half ounce of gold solution in a graduate, put in a piece of litmus paper, add solution of bicarbonate of soda until the litmus paper turns blue again, and add to the toning bath. A batch of a dozen prints should tone in from fifteen to twenty minutes. In winter the bath should be warmed, also the washing water and the hypo solution.

For the fixing bath take of a saturated solution of hyposulphite of soda, say five ounces, put it into a pan used for nothing else, and add twenty-five ounces of water; that is, have the fixing-bath about one to five. Drop in a piece of blue litmus paper, and if it turns the least bit red, add enough of the bicarbonate of soda solution to turn the litmus paper blue again. Prints toned in an alkaline toning bath and fixed in an acid bath are never satisfactory in my hands.

To fix the prints, place the prints in the hypo solution and turn them for fifteen or twenty minutes.

Now place the pan in the sink and let a small stream of water run slowly into the pan, turning the prints all the time for two or three minutes; then empty out all the water in the pan, attach a piece of hose to the faucet, and let a gentle stream run over the prints all night.

This is the routine upon which I have settled, and now the operation of toning and fixing a lot of prints is a pleasure instead of a fearful ordeal, as it used to be. I used to make up a new formula for toning bath every time I made a failure, and consequently made a failure every time I made up a toning bath, simply because I did not try one bath long enough to find out how to use it successfully. This is a simple toning bath. It may not be the best one, and may not work as well on some brands of paper as on others, but I have found it good in my hands, and now I stick to it, and when I get a poor batch of prints it is because I have blundered somewhere and not the fault of the paper, the silver bath, the toning bath, or the fixing bath. They are all right. The trouble lies with me.

W. J. Hickmott.

Hartford, Conn.

ORTHOCHROMATIC PHOTOGRAPHY OF PAINTINGS.

About ten years ago it occurred to me, when trying a very yellow old painting, to filter out the rays of higher refrangibility with a yellow screen. My experiments at that time were failures, as I could not obtain sufficient length of exposure.

Four years ago some paintings—very bad in color for copying—were brought me. One in particular, a head in yellow tone, refused by ordinary methods to give anything but impressions of the brush handling; the head would not come out from the background; not a trace of it showed on the negative.

The interposition of a yellow glass gave a very good result with an ordinary plate.

At a later date an "Old Master," a Madonna by Murillo, with a yellow halo round the head, which had been intractable in the hands of a brother photographer, gave me most excellent results by the same means.

In a law case, an endorsement, written with violet ink, faded, and the paper soiled and discolored, would not copy at all in the usual way. The yellow screen brought that out strong and clear.

While these and other experiences have made the power of orthochromatic photography clear to my mind, yet there are many paintings in copying which not the least benefit comes from the process, and I am informed that even in Germany it has not as yet been found practicable to apply it ordinarily to portraiture.

Neither is the idea conveyed by the name, viz., that it gives correct color values, true. The values of the yellows as compared with the blues, are very much corrected, those of the reds less so, but in no case are they made exactly as they would be given in black and white by a practiced eye and hand; and when we consider that no photographic process can render even black and white values with exactness, we can infer that for the present strictly orthochromatic photography is impossible.

W. J. Baker.

Buffalo, N. Y.

A CONVENIENT CARRYING-BOX.

In preparing an outfit for a journey with my camera through a part of the Rocky mountains, I thought it would be desirable to have a smaller-sized carrying-box in addition to the one in which the camera, a dozen plate-holders, etc., were usually packed. Not wishing to spare the room which such a box would naturally occupy, I worked out, as follows, the idea of a box which can be packed flat when not in use. The sides of the box and of its cover are each made of four pieces of pasteboard, linen-covered, and with flexible corners. The top and bottom are of wood of sufficient thickness, say three-quarters of an inch. Cherry is perhaps as good as anything. A little rabbet around the edges allows the sides to slip on tightly, the projection (which should be just the thickness of the linen-covered pasteboard) forming a protection against dampness or dust. The sides of the cover are fastened to the top by a number of small round-headed screws. The bottom and sides of the box itself are arranged in the same way. The whole box, when in use, can be carried by an arrangement of straps like a shawl-strap.

Fig. 1 shows the top and sides of the cover, ready to be put together. Fig. 3 shows the box "set up" and ready for use.

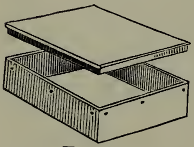


FIG. 1.

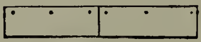


FIG. 2.

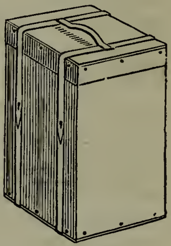


FIG. 3.

When taken apart, by removing the screws and taking out the pieces of wood, the sides will collapse, and the whole thing will pack perfectly flat, as is shown for the sides of the cover in Fig. 2.

I have found this contrivance very useful and convenient, as it will take a camera and two or three plate-holders on short trips, or where the large box would be in the way.

Charles E. Willard.

NEW YORK.

A CRY FOR SIMPLICITY.

THIS is intended as a sort of criticism based on some of the principal exhibits at the Chicago Convention, and yet, it is hoped, in a manner so general and self-explanatory as to be of interest to readers who did not attend that convention.

Man's reason demands unity, but his feelings, the changeable in him, insist on variety, hence to him an object must possess variety fused into unity to produce æsthetic satisfaction ; consequently a picture must have unity, one main idea, to intensify and bring to a focus the entire composition. This principal idea is the diamond, and the setting, except only so far as it enhances it, has no right to existence in connection with it. Therefore the light and shade, the whole composition, the totality of variety should tend toward and be crowned in this unity. Let this be the foundation for what follows.

Judging the Germans by their exhibits at our conventions, plain lighting or breadth of light as contrasted with narrowness of shadow predominates with them. It is the favorite method with artists, giving delicacy of modeling with softness and minuteness of detail. But in this particular many of the German pictures at the Chicago convention had a tending to flatness, owing more, however, to rather full timing than method of lighting.

On the other hand the Americans, as a rule, are characterized in their productions by two-thirds shadow to one of light, the so-called Rembrandt effects, although Rembrandt never resorted to such *bizarre* methods. His was the plain method, the light being brought to a focus on the principal parts of the main subject, and gently diffused over the principal objects, leaving the minor ones in comparative obscurity—a variety of tints brought to a brilliant unity.

I have only room to say that with us there is a tendency to exaggerated effects in lighting which is very reprehensible and that a return to simpler methods would be paying homage to good taste.

In passing to position and composition we turn again to the German exhibit, and it must be said for these Germans that they appear to have a clear perception of the conception they wish to realize by photography. Everything necessary to body forth the idea is attended to and nothing redundant is added to mar the completeness of representation. It is said that their conceptions are simple, homely, common, and lack the noble, grand, and sublime. But do they not give us the repose, grace and dignity of simplicity, an ideal real of German life of to-day? It is the bloom of German culture, of their national spirit.

The American being always politically free concludes he is spiritually free also and, without experience in the simple, he betakes himself immediately to the sublime, determined to portray that or nothing. But in a world of sense, spirit is not free, excepting in so far as it masters and assimilates objective reality, and thereby harmonizes the actual with the ideal. Art has its mechanical, its scientific side, its proportion of form, its relation of facts and their sensuous representation, all of which "must be brought to perfection before free art may arise and display itself." We lack their scientific spirit, substitute mere knowing for scientific knowledge of art, hence the numberless loud, suggestive, brazen positions and the infinite crudities in our photographs.

Grace is the beautiful in the voluntary movements; dignity is the mastery of the involuntary movements; and repose is latent energy, conscious power in reserve; all these should be present pictorially, even in the portrayal of the whirlwind of passion. Hamlet's advice to the players is aptly suitable to photographers. When a speaker puts forth all his power do we not say he rants? When a general puts in all his reserve has not the battle become desperate? The mind intuitively notices such displays of weakness, and instinctively arises contempt or pity, which when not grounded in love is a species of contempt. And do we not display our weakness when annually we take to our conventions so many mere individual portraits and so few pictures? Chemically we are fully abreast with the times, and for technical work, everyday experience is instruction enough; but in some directions we are pictorially far from the present limits of the capabilities of photography.

W. H. Potter.

INDIANAPOLIS, Ind.

REVERSING THE PRINT.

USING permanent bromide paper, the negative may be reversed in copying with the camera. There must be means for holding the negative in front of the camera, and adjusting it so as to be exactly parallel to the print. The scale of the copy must be adjusted, and the focus must be adjusted so as to show sharp at the corners. These adjustments it is sometimes difficult to make, from the want of sufficient light to make the image fairly visible upon the ground-glass. When the negative is of the size of the desired print, all these adjustments may be dispensed with, by resorting to contact printing in a suitable camera. It is necessary that the rays of light should be nearly parallel to avoid blurring. I have been successful in making such prints by the following method:

The length of the camera was about twenty-four inches, being the compound camera described by me in the last ANNUAL. A lens of very short focus, either convex or concave, when the light was reflected upon it by a mirror, formed an image of the sun, so small that the thickness of the negative did not interfere with the sharpness of the print. Unless the focus is very short, the plate will not be covered, and the light will be too intense for convenience. On the other hand, the shorter the focus the more unevenness in the illumination there will be, from particles of dust upon the lens. I found the quality of the mirror comparatively unimportant, and took very little pains to receive the light in a straight line from the sun's reflection in the mirror to the center of the plate. For line-work I do not find the unevenness of the illumination to perceptibly affect the result. The only effect of reducing the aperture is to reduce the amount of illuminated surface; it will have no influence upon the necessary time of exposure, which can be estimated from the degree of illumination of the ground-glass. I have also been successful in using the sky instead of the sun for illumination, sometimes placing a mirror in front of the camera to avoid tilting it. This dispenses with the lens, for which is substituted an aperture, which can be less than one-fourth of an inch without requiring a tedious exposure, for in this case the time of exposure depends upon the aperture.

Henry M. Parkhurst.

New York.

A HOME-MADE TOURIST CAMERA AND A NEW TRIPOD-HEAD.

The camera about to be described is original with the writer, and has been his constant companion for three seasons, and, in spite of many hard knocks, it is now as good as new.

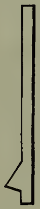


Fig 4.

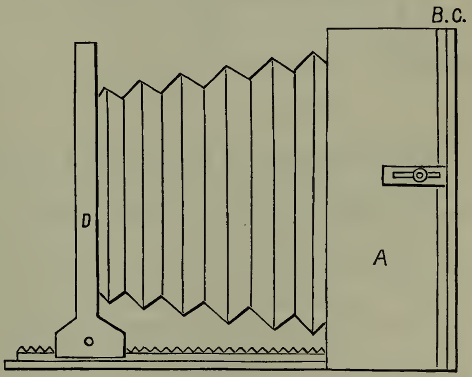


Fig. 1.

The result aimed at in the construction of this camera was to secure an efficient instrument capable of being closed like a box with the lens protected from dust and breakage in the box itself.

The material used in its construction was cherry, one-quarter inch thick for the sides and top, and one-half inch thick for the bottom and the bed-board which closes the box. The accompanying figures will make its construction plain: Fig. 1 shows the camera open for work; Fig. 2 shows it closed for transportation with the lens inside and in the proper position for work; Fig. 3 is an elevation of the front, showing the sliding frame in which the lens board is fitted light-tight. Figs. 4 and 5 show side and front views of the two brass castings which are screwed fast to the bottom of the front, and which have V-shaped projections cast on the inside, fitting into corresponding grooves cut in the rack pieces. These castings are three inches long, one inch wide at the narrowest part, and two and one-half inches wide at the base which is one inch in height to the point where the width begins to diminish.

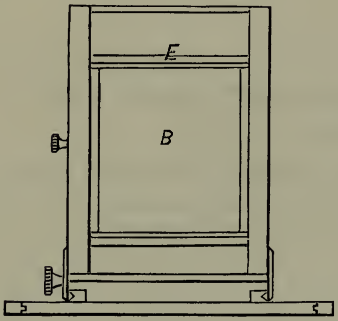


Fig. 3.

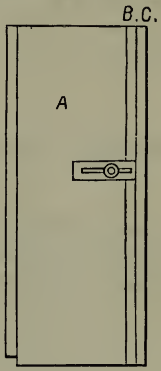


Fig. 2.

The dimensions of my camera for whole plates are as follows: A, Fig. 1, is nine and a half inches square inside, by three and a half inches deep. The swing-back B is a frame of three-quarter-inch stuff, same size as the outside measurement of the camera. To this frame are fastened three brass strips two and a half inches long and three-quarters of an inch wide, having a quarter-inch slot cut in them to take the thumb-screw shown in Figs. 1 and 2. Above and below the side strips are screwed two narrow strips of brass to prevent the frame from dropping down when pulled out at top or bottom. One of these slotted strips is screwed to each side of the frame and one is fastened to the top, thus giving both the vertical and the horizontal swings. C is the reversing frame which carries the ground-glass frame and the plate-holder when the former is removed. Both the ground-glass and the plate-holder slide in grooved ways placed on the back of the frame.

The front, D, Figs. 1 and 3, is nine inches high and six inches wide. On each side of this at the bottom are screwed the brass castings shown in Figs. 4 and 5. Through these passes the rod on which the focusing pinions are fastened.

On one side of the front a two-and-a-half inch slot is cut to take the thumb-screw which fastens the sliding frame E, Fig. 3. This frame is rabbeted to receive the lens-board. The strips which carry the focusing rack are three-quarters of an inch square and are screwed to the bottom-board.

The bottom-board is made of half-inch stuff and is hinged to the inside of the bottom of the camera. It is battened on the sides to prevent warping. When open, as in Fig. 1, it is clamped rigidly in place by means of the fastening described below, and shown in Figs. 6, 7 and 8. When closed, as in Fig. 2, it is held in place by two spring hooks of the pattern seen on some of the Scovill boxes. This same style of hook is also used to fasten the top of the reversing frame, its bottom resting on two pieces of thick brass screwed underneath the swing-back, their ends being turned up at right angles.

The camera is bound with brass as an additional safeguard against breakage. All the joints are dovetailed and glued.

When the woodwork is put together it is sandpapered, given a coat of oil, and polished with shellac and oil.

The bellows can be had of any dealer in photographic materials and is fastened to the backs of frames B and E.

THE TRIPOD-HEAD.

This is to me not the least valuable feature of the camera. It does away with clamping hooks, screws, *et hoc genus omne.* With it a lost screw is an impossibility, and there is no heart-breaking, profanity-provoking fumbling to find the screw-hole in the bottom of camera.

It can be attached to any form of camera and used with any tripod-head, wood or metal.

Figs. 6 and 7 show the arrangement in all its parts.

A, Fig. 6, is the part which is screwed to the bottom of the camera in place of the usual screw-plate. It is a piece of brass casting, two and a half inches long, planed down to one-eighth of an inch in thickness. When planed down, have a piece half an inch long sawn from one end. Screw this to the back of the folding bed, having first cut the bed to take it. Its face must be just flush with the bottom of the bed, and its edge flush with the back edge of the bed. The longer piece is screwed to the bottom of the camera in such a way that when the bed is let down the two pieces will practically form one piece.

B, Fig. 7, is a solid piece of brass, of the size and shape shown, and an inch and three-eighths long. It must fit accurately into A, and should be a trifle thinner than the beveled part of A, to give it a good bite when the screw is tightened. A hole is bored in the center and threaded to take the screw E, Fig. 8.

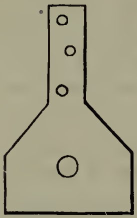


FIG. 5.

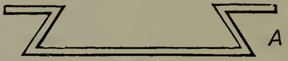


FIG. 6.

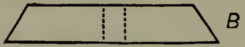


FIG. 7.

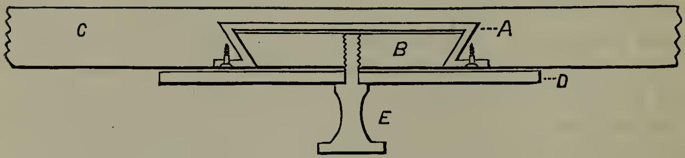


FIG. 8.

Fig. 8 shows a section through the center. A is the part screwed to the back part of the camera; B is the brass plate; C is the camera bottom, D the tripod-head proper, and E the tightening screw.

B is always left on the tripod-head. To use, the screw is eased a turn or two, the camera, with the bed folded up, is placed on the tripod-head and pushed forward so that B slides into A. The bed is now let down and the camera pushed back as far as it will go; this brings B across the junction of the two pieces of A, and a turn or two of the screw binds the bed firmly in place, without the bother of extra screws or hooks. Since I began to use this attachment I have been happy, and I recommend it to all careless photographers who invariably leave their screws at home, as well as to those who appreciate anything which simplifies the preliminary manipulations of the camera.

Rev. W. H. Burbank.

NEWBURG, N. Y.

STEREOSCOPIC PICTURES.

A SPEEDY return to this class of photographic work is among the certain events of the future; those of the old amateurs, who, like the writer, have taken up this almost forgotten style of picture during the past summer, are all wondering why they had ever been induced to lay it aside, and are to-day more enthusiastic in its praise than ever before. For this enthusiasm there are many reasons. The apparatus used is very portable. Views suited to this kind of picture are to be found by the hundred, while for the larger sizes, 6½x8½ and 8x10, greater study and attention to detail and light is required.

At almost every turn in a country road, every few rods along a winding stream, there will be found charming stereoscopic pictures; while comparatively few will give an interesting single view. In the stereoscopic picture every detail is easily distinguished, the distance is charmingly distinct; the glen or vista, that in the single view would appear dark and indistinct, is in this style of picture distinct and true to nature. To those of my readers who may not be informed as to the methods employed in making these pictures, it may be best to give a few general directions: The size of camera best suited to this class of work is one in which a plate measuring 4¼ x 6½ is used, or the size known as 5 x 8 inches; the first named is large enough.

Two lenses (matched) are required; these are to be placed in front of the camera, instead of the single lens, for the first named size 3¼ inches apart between centers, the last named 4 inches.

A partition is placed in the camera to prevent the light or image cast by one lens from interfering with the image cast by the other lens, the making of the negative being in all respects exactly the same as with a single lens. Some little care is required in mounting the picture, which should be on a card 7 x 4 inches. The prints when dry must be cut exactly the same size; this size should be 2⅞ wide by 3⅝ high, always being particular to place the right-hand picture as presented in the print on the left-hand side of the cardboard, and the one onthe left-hand, on the right-hand side. To cut of exact size place on print a piece of glass of size given for print, and cut around it with a knife. On the cardboard mount mark a line in exact center, that the cut photographs may be exactly placed.

This work of mounting is simple enough to the painstaking amateur, but to the man who is not willing to *labor* for *results* it will be too troublesome to interest him; this remark applies as well to all branches of the photographic art.

I sincerely trust that there will in the coming year be a rapid growth in this, to my thinking, the most delightful branch of amateur photography.

Chas. Wager Hull.

New York.

MAGNESIUM LIGHT EXPERIMENTS.

Every year, regularly as the winter season returns, the question of artificial lighting turns up.

To obtain pictures by means of artificial light has been more or less constantly before both professional and amateur. The amateur requires it for the better lighting of rooms in the home portraiture department of the art. The professional requires it in the dark days of winter and at night where photography is prosecuted as a matter of business. Under such circumstances artificial lighting has been found to be a great benefit, and many successful results have been obtained by its use.

In writing up some experiments in the "British Journal Almanac" last year, I there described a series of exposures. The apparatus used was clock work lamps, and the illuminant magnesium ribbon This mode of artificial lighting will be found all that could be desired for the further illuminating of rooms in home portraiture where the apartments are insufficiently lighted by windows, etc. In such cases, by a careful arrangement of reflectors, many fine effects have been produced with this clock-work lamp and magnesium ribbon.

However, where the place is perfectly dark and it is the only illuminant, the light tends to produce hard pictures, being too condensed and illuminating in circles. The reflector used for the above experiments, which was placed at the back of the light, was a silvered plate; but to gain the desired softness and diffusion I substituted for the silver plate a reflector, concave, made of opal glass, by which a much greater diffusion of light was obtained, and a much softer, better negative was the result. The time of exposure was from ten to twenty seconds.

Since the above experiments were made, another new artificial light has been introduced into the market and duly patented.

According to the formula for the powder used for producing this new light, the experiments we made were with the following composition:

Chloride of potash	60 grains.
Magnesium powder	30 grains.
Sulphate of antimony	10 grains.

The above chemicals are mixed together on a smooth sheet of paper until they are perfectly blended.

This powder can be ignited by any spark or red heat where electricity is not handy; the red of a burning vesuvian will do well.

The complete lighting is but a short flash. Our experiments have been as yet crude, but the trials speak well for the future usefulness of this powder as an artificial light for photographic use.

One of the first experiments was a group taken in an ordinary room by a flash of the powder. Others were made in a darkened studio. For first attempts they show fairly what might be done when time and consideration are taken in arranging reflectors to throw back an artistic light on the sitters.

There are many chemicals that may be used with the magnesium powder for producing similar lights, such as prussiate of potash, sodium, lithium, calcium, etc., but the formula noted above will be found all that can be desired for experimental purposes.

This composition is better to be burned in a rough lamp with escape chimney for the smoke, or the atmosphere is sure to get charged with it after one or two exposures.

Both in the case of this powder process and the lamp and magnesium, means for conducting the smoke away is almost essential if many pictures are to be made one after the other.

Another group of eighteen was taken after the above was written; the detail is very perfect. In this case to lengthen the flash and thus give it a little longer exposure, the powder was placed in a train of about nine inches long, the light being applied to one end; the quantity of powder used was two drams.

During the dark season this class of work is a source of interest and pleasure to many, and if any hints in the foregoing help them along, this rough outline has not been written in vain.

George Mason.

GLASGOW.

MUSINGS BY THE WAY.

'Tis a trite saying that there is "no royal road to learning," and this saying is as applicable to photographic art knowledge as to any other kind of learning.

Many times there is a choice of roads, and some of the more fortunate ones may have been able to find one much shorter than others.

For instance the men who commenced twenty or thirty years ago could gather but little knowledge beyond their own experience and that scrap by scrap from many and uncertain sources.

Some gained their object by a long and difficult road, while others, after weariness and loss of money and their best years, gave it up as a failure.

I doubt not there are many now, who see but little of the splendid collection of photographic literature, and content themselves with the idea that there are a few mysteries connected with their business that the world knows not of.

Happily nearly all these narrow-minded and worn-out notions are passing away, and in their place we have the question of art principles, together with the harmonizing of light and shadow, the dark-room manipulations. Those who have a knowledge of these points will be known as being in the advance.

Many living in the smaller towns and cities, complain of not having material to make pictures, that they may compete with what they have been pleased to call their more fortunate brethren in the large cities.

This is all a mistake. There was a time when I, too, looked upon this in the same light, but now I begin to realize how many beautiful and rustic scenes and subjects were passed by that I would be glad to recall and make use of now. I begin to realize that the study of photography, the same as in other branches of knowledge, is a never-ending struggle.

Every-day life in a photographic gallery is like the changing scenes of a grand panorama passing before us.

To-day the light is faultless and temperature all that can be desired for perfect development, but to-morrow a change comes, it is a cold, raw day in November, the sky cloudy at times, subjects are in bad humor, but the baby must have a beautiful pose, the middle-aged widows, with hopes long deferred, as well as those of more mature age, do not wish to appear as if the shadows of their days were lengthening.

Now comes trouble for the operator. His plate develops slowly, the lights and shadows are harsh and muddy. What is the trouble? His manipulations are not in harmony, and now is the time that skill and experience is able to so change the manner of exposure and development that the results, under all circumstances, will be passably good.

Then do not imagine good work is made by some pet formula, but by the judicious use of those things to be found in almost every gallery.

For my general work I have used, for developing dry plates, soda in every conceivable strength with the same result.

If "we are certain of circumstances," our works are governed by it, and if we reach the top round of the ladder, it will only be over the rough and rugged road of study and practice.

H. McMichael.

BUFFALO, N. Y.

THE "EQUIVALENT FOCUS" NOT A CONSTANT.

It is a universally adopted and apparently well-established optical rule to express or term the optical power of a system of lenses or compound objective by its so-called "equivalent focus," and, in fact, optical science regards the relation of this equivalent focus to the magnifying or reducing power of a compound to be perfectly analogous to the relation between the focus (or focal length) and the power of a single lens. Consequently, all calculations regarding the optical properties of a compound are based upon its alleged constant equivalent focus and "optical center," the former meaning the focus or focal length of an imaginary single lens without thickness, called the "equivalent lens," of a magnifying or reducing power, equal to that of the compound, with the presumption that if such imaginary lens is equal to the compound, in one case or under any conditions, it must be so in all other cases and under all possible conditions; the latter, meaning the point where the optical axis cuts the plane in which such equivalent lens would have to be placed to produce the same magnifying or reducing effect as the compound. Presuming the above theory—namely, that the focus of the "equivalent" single lens can, as a constant mathematical value under all possible circumstances, be regarded as analogous to, or identical with the compound focus of a corresponding system of lenses—to be correct, then, for instance, the images produced by the two lenses would be equal in size not only in the case when the object is the sun or the moon or any other very remote object, but also in all cases in which the object is situated so near to the lens that the rays of light coming from one point of the object and entering either of the lenses can not be regarded as parallel, but, are more or less diverging.

The writer, having had doubts arise regarding the correctness of the above presumption, in a certain case where great accuracy in the determination of the distances of object and image from the optical center of a compound objective was required, and, in which the results of the measurements did not satisfactorily correspond with the values obtained by calculations made at the same time, was induced to test the stability of the so-called equivalent focus and optical center theoretically and discovered that:

I. Unlike the focus or focal length of a single lens (*regarded as having no thickness*), *neither the alleged equivalent focus nor the optical center of a combination of lenses are to be regarded as constants, but both vary with the distance of the object from the combination.*

II. That this variation is the greater the wider apart the lenses of a combination are.

III. That as the alleged equivalent focus increases in length, it respectively decreases as a mathematical value with the increase of the distance of the object or source of light.

IV. That the optical center of the system moves toward the light source or object when the latter is receding from the objective.

To avoid possible misapprehension of my theory, I may say here, with particular reference to the above statements, that said variation of the equivalent focus with the distance of the object must not be confounded with the generally-known change of the distance of the image from the objective when the distance of the object is altered, this change being always inverse to the former; but the above-mentioned variation must be understood to be independent of it, and is a heretofore unknown peculiarity of the compound lens or system not possessed by the single lens, which also, just like the compound, changes the distance of the image with that of the object, while its *real* focus remains a constant value for all possible distances of the object.

The following example, representing an extreme case, may serve as a convenient and practical demonstration of the above theory. Suppose an objective to be composed of two lenses equal in size and focus, and mounted at a distance from each other equal to such focus; then suppose parallel rays of light to enter one of the lenses—which we will call the front lens—in the direction of the optical axis of this system, this light will, after being refracted by the lens, converge and come to a point just at the real focus of the lens, and an image of the light-source or object will be formed just in the plane occupied by the other lens, which we will call the back lens. Now it is evident that, in this case, the back lens takes no part in the formation of the image, but that the same is formed by the front lens alone, and the alleged equivalent focus of the system must, therefore, in this special case be regarded as equal to or identical with the real focus of the front lens, while the optical center of the system is situated within the front lens.

Now let the light-source be just near enough so that the rays, when entering the front lens, are slightly diverging, then they will have to pass through the back lens before coming to a focus, and the back lens will now take part in the formation of the image, which will now be slightly smaller than if it were, as before, formed by the front lens alone. The system is now equivalent in power to a single lens of slightly shorter focus than the front lens, and the optical center has moved slightly toward the geometrical center of the system.

It is now clear that the nearer the light-source or object approaches the front lens the farther away the image moves from it, taking the back lens more and more into co-action, and thus continuously shortening the focus or increasing the value of the equivalent lens and, at the same time, moving the optical center more and more toward the geometrical center of the compound. Progressing in this way, let the object arrive at a distance before the front lens equal to its own focal length, then the now strongly diverging rays, after passing through the front lens, are refracted in a parallel direction, in which state they enter the back lens, occupying its full diameter, and thus causing its full co-action in the formation of the image at the focus of this lens. The image is now equal in size to the object itself and the light cones, by which it is formed, are just as large in angle, as they would be, if the back lens were placed close behind the front lens, thus forming, together with the front lens, a solid objective of half the focus or double the power of either separately. The equivalent focus of the system must, therefore, in *this* case, be regarded to be equal to the foci of the front and back lenses combined, which is just half what it was in the first case, where the light rays coming from the object had to be regarded as parallel; and the optical center is now coincident with the geometrical center. If the distance between the two lenses is reduced so as to be shorter than the focal length of the front lens then, in the first case, where the rays, coming from the object, are parallel, the back lens will aleady take part in the formation of the image and the equivalent focus of the system will be accordingly shortened, while, in the case where the object is situated at the focal distance before the front lens, the result will be just the same as if the lenses were placed farther apart; hence the ratio of variation of the equivalent focus is reduced by the shortening of the distance separating the two lenses, and will be the less, the shorter this distance is until there is no difference in the value of focus of the equivalent lens for any two different distances of the object, when the two lenses are combined to one single lens.

From this example it will now be clearly understood that neither the equivalent focus nor the optical center of a combination can be relied on as a basis for calculations of any kind, and their value consists merely in affording a more or less convenient means for an approximate guess as to the relative magnifying or reducing power of the compound, and should, therefore, properly be treated only as such, and termed accordingly. A compound *photographic* objective, for instance, should, in regard to the size of picture produced by it, not be estimated, as is customary, by the "equivalent focus," as constant value in all possible cases as to distance of object, but only by the *mean equivalent* with reference to the purpose for which it is designed or used. For instance, a certain objective may have, for landscape work, a mean equivalent focus of, say, sixteen inches, but if the same lens be used for portrait work, in which case the mean distance of the object is much shorter, then the mean equivalent will shorten accordingly, and may be, perhaps, fourteen or even thirteen inches, and so we should say the mean landscape equivalent of this lens is sixteen inches and the mean portrait equivalent fourteen inches. The nearer the object the shorter the equivalent.

Having now clearly shown that neither the focus of the equivalent lens nor the optical center of a compound objective remain constant at different distances of the object, as do both focus and optical center of a single lens, and that, therefore, neither one is fit to serve in a similar way as in the case of a single lens as a basis of any calculations regarding the optical properties or power of the compound, but that both would have previously to be determined in each special case for the certain exact distance of the object or source of light, from the special foci of the lenses, their position, respective distances from each other, and their thickness (if considerable) as the true constant quantities or elements of the compound, it is evident that all other calculations can, and properly have to be, *directly* based upon them without regard to the equivalent lens or optical center, which are, in fact, of no importance in the determinations of the optical power of the compound objective.

For the benefit of those who care to calculate the magnifying or reducing powers of objectives consisting of two lenses (photographic objectives) at given distances of the object, I give the following formula:

If a is the focal length of the front lens,
b is the focal length of the back lens,
c is the distance between the lenses,
d is the distance of the object from front lens,
m the magnifying (or reducing) power of the compound, or the ratio of the image to the object then is:

$$m = \frac{\left(\frac{d\,a}{d-a} = 9\right) \left(b\left(\frac{9}{9-c}\right) = r\right)}{(9+r)\,d}$$

The thicknesses of the lenses are disregarded in the formula. If they are considerable, and great accuracy is required, then they might be included. Thereby proper regard is to be taken to the refractive indices of the glasses (crown and flint). But in the case of photographic (portrait and landscape) objectives the thicknesses of the lenses may safely be ignored.

The distance of the lenses may be determined by directly measuring outside in the center, and subtracting half the thicknesses of the lenses. The foci of the lenses can be obtained with great accuracy in the following way:

Darken a room by shutting off all light from the windows or doors, allowing only such light to enter as will pass through two parallel slits in a piece of tin or black cardboard. The slits should be not over a sixteenth of an inch wide, and three or four inches in length, and a certain exact distance, measuring from either side, say ten inches apart. Right opposite to these at an accurately measured distance, say twelve or fifteen feet, place a white screen, and a camera, carrying the lens to be measured, between the two in such position that the images of the slits are sharply focused on the screen, and measure the distance between them. Let a be the distance between the slits at the window, which is the size of the object; b the distance between the images on the screen or size of the image; c, the distance between the object and the image; f, the focus of the lens, thus is:

$$\left(\frac{b\ a}{b+a}\right)\left(\frac{c}{b+a}\right)=f$$

If the compound consists of more than two lenses, as is the case with most microscope objectives, the matter becomes more or less complicated, and this the more so, as the thickness of the lenses and the refractive indices of the various glasses, which often are three or four different kinds, then become very important.

Ernst Gundlach.

Rochester, N. Y.

COMPOSITION IN LANDSCAPE PHOTOGRAPHY.

It has been my fortune during the past two or three years to inspect so many photographs of landscape subjects, most excellent technically as photographs, but utterly lacking in natural and artistic effects, that I feel constrained to submit a few lines special pleading to the great and constantly growing army of amateurs, that they will earnestly endeavor to give us *pictures* as the result of their labors. A photograph may reproduce any scene, with perfect fidelity to nature, and yet be utterly lacking in all essentials that gave such a charm to the original. Two operators attempt the same view. The one presents us with a "thing of beauty," glowing with the spirit and fire of nature; the other, a flat, maplike reproduction of the scene; a body without a soul. It is quite as possible for the photographer to infuse his individuality into his work, as for the artist in colors or mochrome to do the same thing. A judicious choice of position, of lighting, of composition, will give many a charming picture, of what to the untrained or unsympathetic eye seem most unpromising subjects.

Most amateurs, upon beginning the fascinating pursuit, seem to be impelled with an irresistible desire to expose as many plates as possible within a given time, and "fire away" their ammunition upon every target that presents itself, without any reference to the suitableness of the subject, or thought as to what kind of a picture it will make when finished. If, at the very beginning, they would make the choice of subject, its composition, lighting, and other *artistic* features, as much of a study as they do the mechanical production of the negative, a long stride would at once be made in the right direction; but bad habits, easily acquired at first, are most difficult of cure. I can recall a typical case of a friend, who has been working several years, and who has made and can make as charming work as anyone; yet he is constantly exhibiting badly composed subjects, perfect as photographs, but utterly devoid of any artistic merits or interest, and upon being expostulated with, returns for reply, "Oh, I only exposed that for fun, I wasn't trying to make a picture." This careless habit, contracted in the beginning, sticks to him "closer than a brother."

Many excellent works on this subject are available to the would-be student, written by far older pens than mine, and I would earnestly urge their careful perusal by all who desire to improve their work, to make it true to nature, and yet to form an artistic individuality. But a few general hints here may not prove valueless to such. The study of landscape pictures by acknowledged masters, whether they be paintings, engravings, or etchings, can not fail to lead one in the true direction. Observe how the lights and shadows are managed, how all are made to lead the eye to some central spot, how some simple object in the foreground is made to relieve the flatness and tameness that would be the result were it absent from the scene, and how the distance melts into partial indistinctness. Nothing can be more false to nature than the minute sharpness in distant objects, to which so many amateurs seem to direct their greatest efforts.

A clump of trees in the foreground, to the right or left of the view, especially if one or more of them inclines quite at an angle from the perpendicular, will often add beauty to the scene, but would completely mar it, if planted squarely in the center thereof, as I have known more than one would-be artist to do. A span or arch of a bridge, with only thin air to support one side thereof, suggests a feeling of instability to say the least; yet how often do we see this absurdity repeated? A view over a body of water, in which the latter element furnishes the only foreground, is always flat and uninteresting; introduce a stump, a rock, some fringe of water weeds, and lo! the scene is transformed. Think of these apparently small matters, fellow amateurs, never make an exposure, without a motive, nor until you have studied all the elements of the subject, in order that you may make the most of them.

Figures add greatly to the charm of a landscape, if judiciously introduced. But this must be looked to carefully. Fashionable modern attire does not lend itself gracefully to the requiremets of sylvan or pastoral scenes. Better leave the human element altogether out than introduce it in such a manner as to be at war with the surroundings.

Endeavor to avoid sharp contrasts, without going on to the opposite extreme of flatness and tameness. A certain harmony pervades the perfect landscape in nature, which it should be the aim of the photographer to reproduce. That he can do so as well as his brother artists of the brush or pencil, is abundantly proved by the work of very many well known photographers, both professional and amateur; and if these hastily-penned hints shall induce even one careless worker to mend his ways, I shall be abundantly repaid.

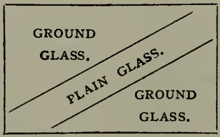
W. H. Walmsley.

PHILADELPHIA.

FOCUSING.

THE following method of focusing dimly-lighted interiors, drawings, prints, etc., and, in fact, every description of work, will be found, on trial, to far excel any other plan:

Take the ground-glass out of the holder, and coat a piece of plain glass with ground-glass substitute; when thoroughly dry, scrape out a piece diagonally from one corner to the other, leaving a strip of perfectly plain glass of about one inch in width.



Replace this in the holder, and slightly oil the plain strip on the ground side. Now set a three-legged magnifying glass by focusing on a newspaper, or fine print, laid on the under side of the plain strip of glass, so as to allow for the thickness of the glass, and set the magnifying glass so that it will always be in focus.

When about to make a negative, get the proper position on the ground-glass; then place the stop to be used, and focus on the strip of plain glass only, by using the magnifying glass.

Signs have been read and sharply focused at a distance of two miles by this method.

In making darkly-lighted interiors, get the proper position on the ground-glass with largest stop, and then put in place the stop to be used; put up a newspaper about the center of the room, and focus on the plain glass.

Should it be too dark to see the print, throw a sun-beam on the paper, or use a lamp; the print can thus be read for a distance of twenty-five or thirty feet, and sharp focus is sure to follow.

A magnifying glass must be used in all cases, as nothing can be seen on the plain glass without it.

Those who try this method may find some difficulty at first, as it takes a little time to get accustomed to focusing on the plain strip of glass; but after a short practice there will be no trouble, and it will not only be a great saving of time, but better results are more certain to follow than by the old method of focusing on a piece of ground-glass.

W. H. Bartholomew.

New York.

PRACTICAL HINTS ON OBERNETTER'S METHOD OF COPYING NEGATIVES DIRECT FROM NEGATIVES.

To better understand what I propose to explain, it is best to repeat first the formula for the method of enlarging, or it may probably be more correct to say, the reproduction of negatives, as described by the late lamented J. B. Obernetter, in the first volume of the American Annual of Photography, page 152.

The negative intended to be reproduced of the original or an enlarged size, is placed in the copying camera, with the film side turned away from the objective, focused, an emulsion plate exposed for a time considerably longer than usual, and developed with ferrous oxalate till the image, a positive, can be perfectly well seen upon the glass side of the plate. After developing, and careful and thorough washing, it is subjected to the action of a chromic acid solution till the plate has been restored to perfect whiteness, so that no dark spots, or dark portions of the plate, can be noticed when viewing it by transmitted light, showing, however, the existing image in faint outlines. After another prolonged washing, the plate is flowed with liquid ammonia, rinsed again, and exposed to daylight the second time. To develop the plate now into a good and serviceable negative, the ferrous oxalate used for the first operation of developing may be employed with profit. The resulting negative, if of sufficient intensity, is then to be fixed in the ordinary manner; washed with dilute hydrochloric acid, to render all shadows clear, and finally washed again.

The camera to be used is the ordinary enlarging camera. To illuminate the negative uniformly, light should come from the north, and be subdued in force by a ground glass screen. The ordinary photographic dark-room can be used, but it should be furnished with a window, which, in order to effect the second exposure with speed and correctly, must be opened and closed with ease. The objective is to be a slow worker, giving even illumination to the very edge of the plate to be copied. Those of the aplanat or antiplanet series, giving a sharp image without any stop, are, on account of the relatively short exposure, preferable.

Of great importance in the whole process is the selection of an emulsion plate of desired proportion. Plate glasses, coated thinly but evenly, are absolutely necessary. Any part of the emulsion film, when of undue thickness, would be productive of yellow stains after the application of the chromic acid. Pre-eminently adapted for the process are Obernetter plates The emulsion contains but little gelatine. Still, any other good emulsion, containing similar amounts of gelatine may, when uniformly spread over the plate, give satisfactory results.

The exposure must be extended so long, that with the application of the developer the image flashes up at once, the plate turns black speedily, and appears so on the reverse side within two minutes after developing it.

Developing completed, either side of the plate should appear black, the whites being only indicated, not being perfectly visible. Without these properties the reproduced plate can not give the fine details and modulations of tone of the original negative.

Chromic acid deprives the plate of sensitiveness; the ammonia afterwards employed restores it again. There is no relation between the first and second exposure or the time of their duration.

The longer the plate remains under the influence of ammonia the more sensitive it will become. Ammonia, on account of its volatility, should be repeatedly poured over the plate, without which it can act with but limited energy It is absolutely necessary to wash the plate thoroughly after every operation; errors or neglect in doing so results in faulty plates.

The second exposure should follow immediately the application of ammonia and washing. Time of exposure varies between one and six seconds, according to intensity and condition of light as well as the distance of plate from the window. To give more distinct points on the proper time of second exposure is quite impossible; experience alone will tell. Developing after second exposure should proceed uniformly, the solution to flow evenly over the plate. After a minute or so the action of the developer will become noticeable; it must penetrate the film down to the glass before its reducing force is visible. Consequently the plate can develop but slowly.

To use a newly compounded ferrous oxalate solution is only advisable when a large amount of bromide of potassium is mixed with it, as, however, any old ferrous oxalate, no matter how turbid it may be, is productive of excellent results, and allows a better control of the process, there is no reason why a recently prepared compound should be used.

The negative, beginning to develop, has all the appearance of being under-exposed, when viewed by reflected light; looking through it, details show to better advantage, even if the plate is not of sufficient intensity. If the second exposure has been too short the negative will absolutely refuse to gain in strength, and no matter how long it is subjected to the developer; whatever there is of it will be lost to a great extent in the fixing bath.

It is impossible to avoid slight fogging at the second development, which is in a manner removable by a bath of dilute hydrochloric acid. Fog, however, does not injure the brilliancy of prints made from reproduced negatives.

Much patience and practice is required to gain proficiency in the process, but when once all difficulties are conquered, every one will agree with me in saying that as for the excellence of the results no other method of enlarging or reproducing can vie with the one described.

F. Mueller.

MUNICH.

MY DARK-ROOM WINDOW.

When the acquisition of my first camera made manifest the need of a developing room, I found available a large closet with two doors and no window, well provided with shelves, drawers and cupboards. One door, opening upon a dark passage, had long been fastened up, and upon its inner face was attached a sink with running water. It was a very simple matter to put a kerosene lamp upon a shelf on the outside of this door, to cut a hole 8 by 10 inches through the panel over the sink, and to insert a pane of ruby glass.

The room remains almost unchanged to-day, save that the ruby glass is no longer there. Indeed, it was soon taken out, and smashed with a big hammer to make sure that it should never be replaced, for the light it gave was altogether too exasperating for my eyes.

The first substitute was two thicknesses of nice tissue paper, ruby and orange, enclosed, for protection against accident, between two sheets of clear glass, and mounted in a frame which would slide easily in grooves above and below the aperture in the door. This combination satisfied me for more than a year, and really comes very near my requirements, being sufficient to dimly light the corners of the closet and abundantly illuminate the developing tray, agreeable to the eyes, and, finally, safe in a reasonable and practical degree. The modern quick dry-plates are sensitive to light of any color if you allow time enough, but it is my present opinion that a light which will not appreciably affect a rapid plate in five minutes is safe enough. The charging of a plate-holder requires much less than five minutes, and the development of a normally exposed plate is completed within that period, while in prolonged development the sensitive film seems to be greatly protected by the layer of developer covering it, and probably also, it becomes less sensitive as development proceeds.

With the combination of ruby and orange tissue paper, I fogged no plates and was contented with the light, and probably I should be using it to-day had not some discussions and papers appeared in the photographic journals which led me to test with a spectroscope the various colors and materials which were claimed to be non-actinic. I found by these experiments that my eye alone was quite unable to judge as to the safety of a given specimen. I found that certain tints of orange were both safe and pleasant, and that "post-office" paper was very nearly the thing, if of just the right thickness. Not finding any glass, or paper or cloth that quite reached the standard, I then attempted to make something better by staining various materials, and in the orange "Diamond Dye" I found the color sought for. In testing glass flowed with orange varnish or gelatine, transparency was found to be quite a drawback, and, if the outline of the flame could be seen through the medium, the light was much less safe than when it was diffused by the addition of a sheet of ground glass or something equivalent. There was nothing new in this observation, but it suggested the orange staining of a fabric which would itself diffuse light, such as white paper of a close texture. Since that time I have been entirely satisfied; a package of orange "Diamond Dye" costs a dime at any druggist's; ten grains dissolved in half an ounce of hot water will thoroughly color a sheet of "bond" paper, 18 by 22, for which I have to pay four cents, and the result is the best non-actinic medium for the dark-room which I have yet seen.

George E. Francis, M. D.

WORCESTER, MASS.

A CONVENIENT DEVELOPER FOR TRAVELERS.

I DO not claim originality in the component parts of this developer, but only in regard to the manner of mixing and using it while traveling, and the extreme safety in which it can be transported in one's baggage without danger to clothing, etc.

I suggest that the chemicals be carried in the shape of salts alone. I weigh both the sulphite and the carbonate of soda into two-ounce portions and wrap up each in separate packages with paraffine paper, and put these small packages into tin boxes. When I desire to develop I get a couple of pint bottles, which can be readily obtained (if not at the hotel for nothing) at any drug store for five or ten cents each. Into one bottle put a package of the sulphite, and into the other a package of the carbonate, and fill them with water, then make a saturated solution of the bromide of potassium in a spoon (or borrow the soap-dish) and operate it with a medicine dropper.

For conveniently handling the pyro, whittle down a wooden mustard spoon just enough to hold four grains of pyro when well packed in.

I am then ready to develop, and when through, I leave the two pint bottles behind, as the loss in bottles and solution is trifling, and get two more in the new locality.

I call sulphite of soda solution No. 1, and the carbonate of soda solution No. 2.

To make developing solution of a normal strength, use as follows, viz.:

Of No. 1, sulphite of soda solution, three and a half ounces; No. 2, carbonate of soda solution, half an ounce; No. 3, bromide of potassium solution, fifteen drops; dry pyrogallic acid, 8 grains. (Two mustard-spoonfuls.)

This quantity of solution (four ounces) should develop twelve correctly timed five by seven plates, of any make. This developer is clean and does not stain your fingers.

In my own work, when not traveling, I do away with the use of scales, and make up a lot of developer, as follows:

I take a half-gallon bottle and in it I put one pound of crystallized sulphite of soda and fill it with water. In another half-gallon bottle I put one pound of carbonate of soda and fill it with water, and I have a small bottle in which I make saturated solution of bromide of potassium, and through the cork of the bottle I stick an ordinary medicine dropper.

I keep my pyro in the little tin box in which it comes, and use from it with mustard spoon.

This developer has the great advantage of being exceedingly cheap, for after using twenty-seven mixtures of the developer (each being four ounces), you will have enough of the pyro to make forty-three more, and enough of the carbonate solution to make one hundred and one more, while the cost of the whole thing will be only eighty or ninety cents.

In regard to exposure. I am apt to rather over-expose and retard in the development very considerably, and sometimes I add as much as twenty-five or thirty minims of the bromide to the developing solution as given above.

There is another very necessary ingredient to secure success, which I omitted, and that is, from one to twelve pounds of patience. With judgment, and plenty of this patience, no one should fail in the proper use of this developer.

Always remember the office which each component part of the developer has to perform, viz.: Carbonate of soda is for detail, the bromide of potassium for contrast, and the pyro for density. All that the sulphite of soda has to do is to preserve the pyro from oxidation, and so keep the developer clear and clean.

A. S. Murray,

Pittsburgh, Pa.

PHOTOGRAPHING MACHINERY.

In photographing machinery the first point to consider is the machine itself. See that it is properly painted and that the paint is not glossy. A light slate color will be found excellent for the rough iron work, and all polished parts should be wiped clean with waste or rags to which has been applied some dark-colored oil usually found about shops, which renders the work clean and subdues the "shine" considerably.

Next look to the light. If the background is to be stopped out, or opaqued, very little if any top light can be allowed; the machine should be evenly lighted from the front. It makes no difference how much light you have provided it is evenly distributed. If in a room or shop, of course all windows or openings behind the machine must be covered. Make the surroundings as neat as possible, moving to one side everything which does not belong to the machine, and see that the floor is swept clean.

The exposure must be governed by the lens, plate and light, but should *not* be on the side of over-exposure; *just right* is always best, but if you must err let it be under instead of over-exposed, and always use a developer with the accelerator predominating.

One which has always given excellent results is the following:

No. 1.

Sulphite of soda	1 ounce.
Water	8 ounces.

No. 2.

Carbonate of soda	1 ounce.
Water	8 ounces.

No. 3.

Saturated solution of bromide of potassa.

To make developer use

No. 1 solution	2 ounces.
No. 2 solution	2 drams.
No. 3 solution	2 minims.
Dry pyro	4 grains.

If the plate has been properly timed, this developer will give a negative full of detail and strength, of a good gray color, and with absolutely no danger of colored fog. For measuring the pyrogallic acid, a mustard spoon will be found convenient, as it can be cut down until it holds just the required amount. If the background is to be painted out, you will require a draughtsman's ruling pen and small bow pen, a lithographic crow quill pen and small camel's-hair pencil, some prepared drawing ink (Higgin's American Drawing Ink, waterproof, is very good), and some black varnish, preferably made by dissolving shellac in alcohol and adding lampblack. Your negative when dry is placed on a retouching frame, and your ruler and drawing pen used to commence with, drawing the lines with the prepared ink close up to all straight parts of the machine; then the bow pen is used in like manner to make the circles and curves, being careful to put a folded piece of paper under the sharp point of the pen; after this much is done the crow quill pen is used to go around such parts of the machine as remain. When you have in this way finished a line in ink around the machine or such part of it as you wish to paint out, you may begin with the camel's-hair pencil and black varnish, working up to the ink line already drawn until you have a solid black background. Do not attempt to paint out when you are nervous or hurried, for it requires a steady hand and considerable time (which increases with the complication of the machine) to be successful.

After the negative is finished the manipulations of printing are the same as for any picture, being careful, however, not to print so dark as to obscure any details, as the machine will not appear completed unless every detail is visible.

A small reading glass will be useful in using the brush and crow quill pen around any small parts of the machine.

After a little practice almost anyone can successfully paint out a background, and will in a short time be undismayed even by the most irregular and complicated piece of machinery.

F. R. C. Perrin.

CRAFTON, PA.

IODIDE OF SILVER IN GELATINO-BROMIDE OF SILVER EMULSION.

WHEN, in the year 1871, Dr. Maddox made his first experiments with gelatine emulsion, bromide of silver was alone used to make his films light-sensitive. It was the same with Kennett's emulsion, and Bennett likewise prepared his highly sensitive films simply with bromide of silver. Abney's researches first directed the attention of the photographic public to the influences exerted by chloride of silver, and more especially by iodide of silver, upon the sensitiveness of bromide of silver gelatine emulsion. Abney's very extensive labors did not, however, give sufficient information on that very important subject. He has found, without any doubt, that the otherwise indifferent iodide of silver alters perceptibly the color-sensitiveness of bromide of silver gelatine emulsion, but failed to notice the entirely different properties obtained when either mixed emulsions or iodo-bromide of silver, simultaneously digested, are employed.

Abney's statements, soon after having been made public, were corroborated by Vogel, who had added iodide of silver to his collodio-gelatine emulsions, to make them less susceptible to the action of the luminous light rays than the ordinary bromide of silver gelatine emulsion.

During a year and a half I have investigated the influences of iodide of silver upon bromide of silver gelatine emulsion. After my very first attempts, I became convinced the subject before me deserved far more attention than it had hitherto received. Results had been arrived at, contradicting in frequent cases all that had so far been generally accepted. In the year 1882, I published in the *Photographic Archive* the results of my experiments, and proved, for the first time, that the light-sensitiveness of bromide of silver gelatine emulsion can be enormously increased by the addition of iodide of silver.

Abney made a series of experiments with mixtures of ready prepared bromide gelatine and ready prepared iodide of silver. I had proposed in the beginning to pursue an opposite course, and precipitated bromide and iodide of silver together. For a long time it had been assumed that either of the methods would lead to similar results, and I myself shared these opinions, expressed chiefly by emulsion makers. Long-continued experimenting convinced me of the fallacy of such doctrines. I followed now all imaginable manners of making emulsions, considered them spectroscopically and sensitometrically, and examined besides every plate as to its behavior towards artificial or natural light, the results of all which, highly important in the different methods of emulsion-making, may be comprised in the following:

Mixtures of ready prepared bromide of silver with gelatine and iodide of silver with gelatine show towards white light a somewhat lower sensitiveness than pure bromide emulsion; the iodide reduces the sensitiveness to the brighter spectrum violet, but the sensitiveness to optically brighter rays is by no means reduced, as has been repeatedly asserted by many.

Precipitating bromide and iodide of silver together, an emulsion of quite different properties will result. The iodide of silver causes here a twofold increase of sensitiveness, one towards white light and another towards the lighter blue rays, an increase of sensitiveness which is manifest during all stages of emulsification and ripening; it is perceptible immediately after precipitation and also after digesting the emulsion for hours.

Of two emulsions, similarly prepared, the one containing iodide of silver will always be the most sensitive, provided the excess of the iodide is not too great.

I have tried all possible proportions of iodide to bromide, from pure bromide of silver and gelatine to pure iodide of silver and gelatine, and subjected plates coated with them to experiments by the thousands. I found, that to add more than five parts of iodide of silver to one hundred parts of bromide of silver is not commendable; three parts usually answer better. To reach the highest sensitiveness neither 3 nor 5 per cent would be sufficient; double these quantities of iodide of silver will then be requisite. I can not, however, advise the use of iodide in such large quantities, as with such emulsions negatives of but feeble intensity can be obtained. It is not very material in practice that negatives containing much iodide of silver fix but slowly, nevertheless the fact should not be underestimated.

To precipitate the haloids simultaneously is by no means necessary for the preparation of an emulsion of highest sensitiveness. Extensive experiments, made to solve the question, and the results obtained, induce me to offer now, for the first time, the following law:

"Highly sensitive emulsions are always obtained when bromide of silver is formed in the presence of iodide of silver."

Emulsions formed reversely will be equal to those prepared from separately made bromide and iodide of silver gelatine emulsions.

I observed, several years ago, how such mixed emulsions may be transformed into the highly sensitive ones by a continuous digestion; they are, however, in photographic qualities, far below what is required of them, even if they have been subjected to heat for hours. To prepare emulsions separately and mix them afterwards, can never be recommended, if for no other reasons, on account of the great labor involved in making the mixture.

The many other advantages given by iodide of silver to gelatine emulsions are sufficiently known, and have of late years been pointed out so frequently, that it is unnecessary to repeat them again.

Victor Schumann.

LEIPZIG.

ENLARGING AND REDUCING WITH ORDINARY CAMERA.

In common with many other ardent but more or less impecunious amateurs who have covetously looked upon the latest and sweetest thing in enlarging and reducing cameras (the Scovill for instance), and owing to exhausted appropriations were compelled to do without it, I have been forced to make my 6½ by 8½ do duty indoors as well as out; with a 5-inch lens the bellows extends sufficiently for enlargements from one-quarter plate to full size, and its ordinary landscape lens answers all purposes of reduction.

A window facing east, a wall at a right angle to it, and an old frame divested of the canvas of some forgotten Titian constitute the entire equipment. The frame being pierced with three holes, forming the points of an equilateral triangle, and the tripod spikes inserted therein, the camera is necessarily leveled; placing the frame on the floor with one edge against the surbase beneath the window, it can be pushed backward or forward with this as a guide to keep it true, providing the camera is firmly clamped parallel to the plane of the window.

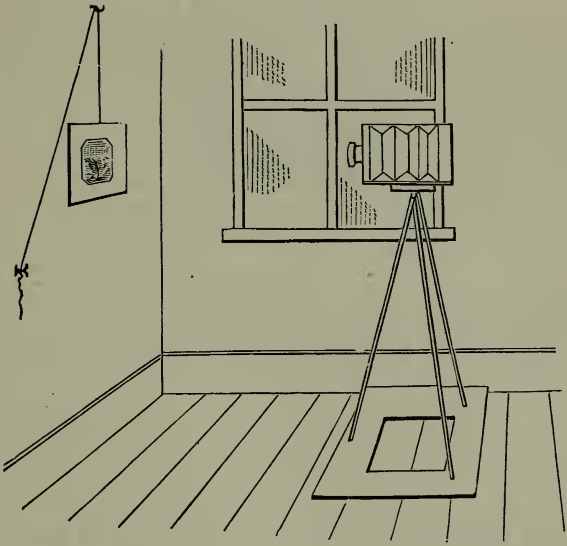


FIG. A.

A small board upon which is pinned the picture to be copied can be raised or lowered by a string passing over a hook on the wall; the hook should of course be in a vertical line with the center of the lens. With some subjects it is advisable to throw a reflected light on the picture from a mirror.

In reducing from larger negatives for lantern positives, the camera is turned toward the window, a strip of wood tacked to the floor serving as a guide in lieu of the surbase. The pane of glass which the lens faces having been coated with ground glass substitute (tissue paper would probably answer as well), a screw partially inserted in the sash frame on each side and one below, home made kits to hold the negatives are notched out at each side, the notches pass over the screws and dropping an inch or so below them the kit is held firmly in the proper position.

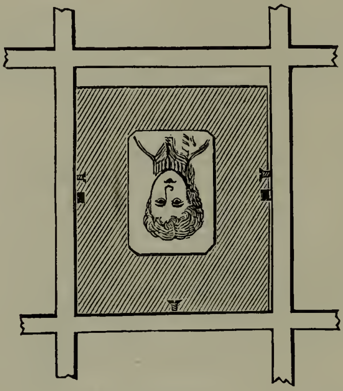


Fig B.

Frank La Manna.

Brooklyn, N. Y.

ON THE CHARACTER OF OPTICAL GLASS.

One of the greatest obstacles in the manufacture of optical instruments has been for a long time the nature of the glass itself, principally the want of homogeneousness in the glass of one and the same lens, by which a perfect uniting of the light rays becomes impossible.*

Fraunhofer was the first to obviate these faults, to understand their cause to be an disproportionate mixing of the materials, and to prevent their occurrence by a new method of melting. Since his time lenses for good objectives are made only of glass perfectly free from "*waves*," an appellation given by Fraunhofer to parts showing different density.

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* Phenomena similar to those found in non-homogeneous glass may be observed in liquids. A solution of sugar in water, for instance, will show strata of different refrangibility, till a perfect solution of the sugar has taken place and the liquid has been thoroughly mixed.

Any one working with objective lenses can easily examine them for this most dangerous feature. It is simply necessary to place a light source at a distance of from six or more times the focal length of the lens from it, bringing the light into focus so that the full area of the lens is uniformly illuminated. If waves are present, the light intensity on the places where they occur is different from the rest, and strata of various kinds can be seen. If they appear like filaments, pervading but small regions of the lens, they are of less danger, but when they occur broader and in large numbers, they will act disadvantageously to the image projected.

A second fault, not so serious, is the presence of strains or distensions in the glass, which result from careless cooling of the molten glass. The irregular deviation to which light rays are subjected by glass strains is far less dangerous than that produced by waves, principally so with large telescopic lenses. To examine glass for that fault is more difficult and requires special arrangements, and is therefore undertaken either in optical laboratories where lenses are ground or by the glass manufacturers.

To construct correct objectives, demands different sorts of glass of different refractive and dispersive power. To make such glass it is necessarily requisite to use various glass-compounds, that is, materials of which glass is made. Many of these compounds produce a flux, not permanent in air (hygroscopic). They are mainly those easier fused and productive of more homogeneous glass. This defect becomes apparent by a bleary deposit settling upon the surface of the film, which does not evaporate spontaneously. If it remains there undisturbed for a length of time it will assume a salty taste. Lenses of such properties require frequent cleaning, in time the surface will be affected, stains and opaque spots will form ; the glass effloresces.

Another demand made on lenses is a total absence of color. Nevertheless, good lenses without this property are being made.

A colorless lens is, however, important in all cases when it is required to unite into the image as much as possible of the light which falls upon the lens, by which a reduction of time in photographic exposures is made possible.

A careful selection of glass from the many existing sorts is indispensable to the correct construction of objectives, with which, when the lenses are but slightly separated from each other, good pictures can be produced. In regard to refraction, as well as the extension of single spectrum regions, glass differs.

The constituent parts for the construction of lenses have become more important, and can be utilized for better purposes in the manufactory of optical glass, since the glass making laboratory of Schott & Gen has been established at Jena, where to a limited extent glass of any refractive and dispersive power is manufactured. The limits drawn are that lenses upon which high demands are made, are either not durable or the immense difficulty of making them free from air-bubbles prevents success. In the most favorable cases, the results obtained reach just these limits.

The calculating optician is frequently compelled to choose between two imperfect sorts of glass, one of which produces an unfavorable form of the objective, and the other offers the difficulty of making the glass free from bubbles.

It is most certainly desirable, but nevertheless not absolutely necessary to work with a good objective, free from bubbles, as long as all the other previously mentioned conditions are conformed with.

Bubbles become hurtful only by their causing a loss of light, the action of the light is, as it were, reduced proportionately in force, to the sum of the bubble present, without however influencing in any way the uniting of light rays. How very insignificant the presence of bubbles in a lens is may be expressed in the following figures:

If, for instance, an objective has a lens diameter of 60 mm., its surface will amount to 2827 square millimeters. Enlarge its circumference all around by $\frac{1}{10}$ mm., the surface will then be 2846 square millimeters, so that an objective of 60.2 mm. aperture, possessing bubbles covering 19 mm. of the whole surface (a case without record) will allow as much light to pass as an objective of 60 mm. aperture without bubbles.

It is surely in the interest of purchasers not to reject an objective with slight faults, like a few accidental bubbles, but otherwise of good working qualities, in favor of others more perfect seemingly in exterior appearance.

Dr. Adolph Steinheil.

MUNICH.

ODDS AND ENDS.

FIRST, who wants to know of a thoroughly satisfactory "finder," which acts also as a focuser for instantaneous work? I saw a good plan at work on my recent visit to the Glasgow Convention. Turn up the ground glass of your camera until it stands vertical, and secure it there with a couple of brass stays and catches; it is now above and in the same plane with the dry-plate when inserted in its holder. To the front of your camera fix a light frame carrying a spectacle lens of about the same focus as the lens you use—this spectacle lens should be in a sliding mount, as it can then be adjusted to agree exactly with the camera lens. Now throw your focusing cloth over the whole. You will then see upon your ground glass exactly the view which will be registered upon the plate, and you can adjust the focus by working the camera-screw with one hand, while with the other you manipulate the pneumatic ball with which the exposure is to be made. In effect you have two similar cameras, one above the other, but without the weight of the second camera; you also see a picture of *similar size* to that which will be obtained on the plate. The comfort of this plan for instantaneous work generally is great.

The so-called "detective" cameras are very well in their way, yielding pictures which could not be got in any other manner, and producing lots of "fun"; but for the highest class of instantaneous pictures—photographs which shall be good technically—they are of little use. For high-class work I recommend a whole-plate camera fitted with a "finder" as described above, and armed with a good lens and Grimston shutter. Then you must have trained models to help you, the "effects" must be rehearsed carefully before hand, and you must be at the right place (say the seaside), at the right time of year (April to August), and work at the right time of the day (ten to one).

All those pictures of divers, leap-frog, jumping horses, athletes, etc., do you think they are chance results? Certainly not; in almost every case the preliminaries have been carefully arranged, every detail studied, and several trial plates fired off, of which the best negative is ultimately selected, to be carefully doctored and retouched.

Now for development. For every plate and every subject my advice is—*go slow.* Begin with a developer weak in alkali, and gradually add your ammonia, or soda, or potash, as the case may be, drop by drop, till you reach the full amount given in the formula for the plates you are using. The preparation of pyro called "sulpho-pyrogallol" is splendid stuff for developing. It is a preparation of pyro with sulphurous acid and sulphite of soda, and the plate never stains under it. Of the alkalies, ammonia is the best to use, though I suppose it is of little use to spread this doctrine in America. Nevertheless, it is a fact; it gives better density and pluckier negatives.

In the making of oxygen gas for lantern work I now invariably add a little common salt to the mixture of chlorate of potash and black oxide of manganese; under its influence the oxygen is given off more steadily. The preparations are:

Chlorate	1 pound.
Manganese oxide	5 ounces.
Common salt	3 ounces.

W. Jerome Harrison.

BIRMINGHAM, England.

REPRODUCING ARCHITECTURAL DRAWINGS.

SITUATED just south of the U. S. Treasury Department, at Washington, D. C., is a building of a Swiss style of architecture, which has caused comment as to what is done therein from scores of the many sight-seers who visit the capital city.

It is the Photographic Bureau of the Treasury Department, and the principal business conducted therein is the photographic reproduction of the architectural drawings of the various public buildings under construction throughout the United States.

These drawings are made in the office of the supervising architect of the Treasury Department. Let us visit this bureau and inspect the methods in use in doing the work, which aggregates annually nearly 15,000 copies of a size 24 by 37 inches.

Obtaining the necessary permit, and having been introduced to the photographer-in-chief, Mr. Gustave Theilkuhl, we were shown around the building, the lower story of which contains separate rooms for the various operations of sensitizing, drying, fuming, washing, toning, and developing the paper on which both negatives and positives are made.

We then ascend to the upper floor from which access is had to an open balcony 20′ by 40′ on the south side of the building on which we see a score or more of the large printing frames containing prints which are being exposed. Busy employees are rapidly carrying in the frames and changing the exposed paper for fresh material, and it is no easy task, for the large frames with heavy plate glass fronts require two men to move them easily; no time can be wasted, for the sensitized paper in use prints rapidly, from three to five minutes in a bright light being sufficient. As the exposed paper is removed from the frames we notice that no image is visible thereon, and upon inquiry we learn that the process used is one in which development of the image formed is necessary.

Upon invitation we walk into the well-equipped gallery adjoining, in which ex-Presidents, Secretaries of the Treasury, and other public officials have frequently sat for their portraits. Passing through this gallery we enter the office of the photographer, where in the course of conversation we obtain the following facts relative to the process employed, which are presented to the readers of the '88 ANNUAL in the hope that the information obtained may be instructive and of use.

The first step towards a reproduction is to obtain a tracing upon tracing linen, in firm lines in a dense black ink; this is done in the tracing room of the supervising architect's office, by lady tracers, who have become quite expert and are found to make a neater tracing than men.

These tracings after having been most carefully compared with the original drawings for ommissions or errors, are then signed by the supervising architect and sent to the photographer, with the necessary order for the required number of copies. As soon as a negative is obtained these tracings are returned to the supervising architect's office and are afterwards sent to the contractors for the various work. The paper used for the negatives as well as positives is that known as the "Helios" brand, although any firm paper of an even texture, which will bear washing and handling while wet is suitable.

The first process is naturally the making of the negative. The paper is "salted" by a bath composed as follows.

Nelson's gelatine, No. 1, hard	4 ounces.
Chloride ammonium	2 ounces.
White loaf sugar	2 ounces.
Chrome alum	¾ ounce.
Water	1 gallon.

The gelatine being first allowed to swell in a portion of the water, cold, then add balance of water and heat until the gelatine has melted, and then add other materials; filter through a cloth into tray and pass the paper through the solution, avoiding air bubbles on paper. The paper is then hung up until thoroughly dry, after which it is sensitized by being coated evenly by means of a cotton swab, with ammoniated nitrate of silver twenty-five grains to the ounce. This latter bath is prepared as follows:

A sufficient amount of liquid ammonia is added to nitrate of silver in solution to cause the solution to become quite brown. Nitric acid is then added drop by drop until the whole is clear once more; it is then tested by hydrometer, and water added until the solution is the strength required, viz., twenty-five grains to the ounce.

After being evenly coated, the paper is then hung up in a dark-room, the temperature of which is about 100 deg. Fahr. When dry it is fumed with ammonia in fuming box for twenty minutes; it is then ready to be exposed under the tracing in an ordinary printing frame, the ink side of the tracing being next the sensitized side of the paper. It is printed to the depth of an ordinary silver print, then washed and toned in ordinary toning bath, and fixed in hypo, two pounds to the gallon of water. The resulting negative has a dense brown color, the lines of the drawing being pure white.

It is now ready to be used as an ordinary negative. Formerly, similarly prepared silver paper was used in the making of the positive, but during the present year experiments have been made in order to reduce the expense and also shorten the time of exposure, the result of which has been the adoption of a chloride of iron process which gives a bright blue line on a white background. The ordinary ferro prussiate paper requires under a paper negative about forty-five minutes' exposure, the present chloride of iron paper from three to five minutes only. This paper is prepared with the following solution:

Chloride of iron..................................	1 ounce.
Tartaric acid..................................	1 ounce.
Water..................................	20 ounces.

Coat by means of a swab, then hang up to dry in dark-room; when thoroughly dry expose under negative in bright sunlight three to five minutes, according to the density of negative; as no image is visible the time must be determined by experiment. The print is then developed until all the lines appear distinctly, in a bath of four ounces red prussiate of potash, to thirty ounces of water. This developer can be used repeatedly until it stains the paper. After washing thoroughly and hanging up to dry, the prints are ready to be finished by being trimmed. The result is a bright blue line upon white ground. Sometimes when only a few prints are required from a drawing, they are made direct from the tracing, a positive from a positive, by the following process. The paper is coated in same manner as before with this solution:

Gum arabic	6 ounces.
Chloride of iron	4 ounces.
Tartaric acid	1 ounce.
Salt	1 ounce.
Water	50 ounces.

Then exposed as usual and developed by being washed over with red prussiate of potash one ounce to ten ounces of water, caution being used to get none of the solution or developer on the back of the paper, otherwise a blue stain will result. Upon developing, the entire surface of the paper will assume a blue tint, the lines being a much darker blue, but upon immersion in the following clearing bath of muriatic acid, one to ten, the background is removed, leaving the lines bright and clear.

All negatives are filed away carefully, for prints from them are frequently required during the construction of the various buildings. Experiments are now in progress upon a process which it is hoped will give black lines instead of blue lines, and will be quick enough to use with as short an exposure as that now required.

J. Albert Cole.

Washington, D. C.

AN AMATEUR'S ROUTINE OF SILVER PRINTING.

In my study of photographic literature I confess to have felt most attracted and attached to those radical but able writers who had a heretical tendency to lop off many time-honored crochets as non-essential and time-killing. It has been my aim therefore, while keeping my work at least within hailing distance of the best attainable published specimens, still to make the various processes simple, certain, and systematic.

It will be necessary to omit many matters of detail and manipulation, and these can be readily gleaned by the very amateur from the excellent hand-books published; for the rest this "routine" will be a safe one to adopt entire by any one whose experience has led to measly paper, blisters, unique but unsatisfactory tones and minor little hitches. It can also be adopted in part; the strength of silvering and toning bath altered to suit one's own practice; but the washing and manner of treatment before toning, while well adapted to the toning bath as described, would require to be changed to suit other formulæ. In these directions 5 by 8 and smaller sizes are considered.

It may encourage some doubting experimenter to try certain innovations herein contained, that he has considered only idle rumor and "book larnin'" so far, since this will afford evidence that such things are actually used with success in practice.

Preparation of the Paper.

Paper should be somewhat damp for silvering. It will then lie flat, and the moisture in it will save that much of silver solution being taken up unnecessarily. I have borrowed a plan of keeping the paper permanently in a well-made wooden box, fifteen by twenty-two, by ten inches deep, with a hinged lid. Common plasterer's lath will do for the inside furnishing. Four strips are fastened edgewise across the box at a height of seven inches, to form a rest for the half sheets of paper put in between two pieces of regulation heavy blotting paper. In the bottom of the box a glass or stone-ware flat dish of one pint capacity is kept filled with water. The original directions gave a wood-cased zinc box, cover and water-tray; but with a little looking after in replenishing the water, the extra cost of metal work can be saved. The writer is also old-maidish enough to mark off the paper on the back with straight edge and pencil into 5 by 8 and quarter-plate sizes, trimming off waste edges all around, being guided by marks on an underlying larger sheet of paper. The albumen paper is held down by a common dress pin at each corner. This saves rough fingering of the paper after silvering, as the shears can easily follow the lines, even if the paper indulges in the pet amusement of curling. For a fresh start, the paper should be in the box a week, if possible, when it will be ready ever after. The same result of dampening can be effected in a few minutes by filling a suitable dish with boiling water, but such paper discolors somewhat in fuming, also after keeping a day, and gives tones with a tendency to brown shades. Immediately before silvering each sheet is rubbed down gently with a rubber of half-inch board, four by eight inches, padded on the one flat side with cotton batting, and covered with white cotton-flannel. This nips "tear-drops" in the bud.

Silvering Bath.

A strength of bath that has been found to work well with several brands of brilliant albumenized paper, is sixty grains to the fluid ounce of water. Its bulk had better be as much as two quarts, even for an amateur silvering half sheets. Although the first outlay will be about seven dollars, the investment is a good one, as this bath can be worked until reduced to half its bulk without replenishing. If one quart only is made up, then a solution one hundred and twenty grains strong should be kept in reserve, and one-half ounce of this invariably added after silvering two sheets of paper. Tap water can be used, and when the solution is complete, add a little carbonate of soda solution, strength immaterial. This will produce a white cloudy precipitate, and when shaken up will settle at the bottom of the bottle for the greater part in a short time, and ought to make a layer of scant one-eighth inch thickness. As this is carbonate of silver, the solution will contain that much less silver, therefore an excess of soda is to be avoided. The object of this precipitate is to make and keep the bath neutral, a secondary reaction during the silvering developing an acid state which this carbonate holds in check. Besides this, add carefully two drops of strong ammonia to the quart of bath, and this addition is to be renewed after some six sheets of the paper have been silvered. This bath will color red litmus paper blue. A new bath made with tap water should now be placed in direct sun-light for a day or two, when any impurities will be made harmless, and will settle to the bottom. Sometimes an occasional jarring of the bottle is required to induce some scum to become sediment. After this sunning, the bath should be systematically kept in the dark. For silvering, the solution is carefully poured out of the bottle into the tray, which may be a home-made one as described in last year's ANNUAL, and is afterwards returned to the bottle through a funnel, is well shaken up, and will then be ready for next time. In the writer's experience, positively no discoloring has ever occurred. A slight film may spread over the solution in the bottle and be transferred to the silvering tray, but it does not matter. The paper is floated with the usual precautions against air bubbles, for one minute, counting from the time the paper rests on the solution until it is taken in hand to be drawn slowly over the glass rod at the end of the tray. to remove surplus solution. A quarter-inch rod will do. Then the sheet is laid, silver side up, on a sheet of blotting-paper and another sheet is put on top and rubbed down. Next, the silvered paper is placed between two sheets of ordinary blank printing paper and again rubbed down, which removes additional moisture, and is ready to be hung on the line by clips or clothes pins at the upper corners, and with two also at the lower corners to counteract curling. The paper will be dry in ten or fifteen minutes and ready for the fuming, or can be kept from the silvering in the evening until the next morning, or it may be kept for several days, falling off slightly in quality. The time of floating need not vary winter or summer, working in a room of a living temperature.

Fuming.

The utility of fuming is pretty generally acknowledged in producing tones of the desired blue-purple order, and in giving greater contrast and brilliancy. The fuming box can be a counterpart of the paper storing box in dimensions and arrangements, with the addition of a tray resting on the cross slats, also made of lath and having mosquito bar for the bottom, being thus adapted for paper of varying size. In a glass dish in the bottom of the box an ounce of strong ammonia is poured, and a few inches above this a card should be suspended of about cabinet size to diffuse the vapor. Ten minutes fuming is sufficient, but fifteen minutes may be allowed after two or three pieces have been in the box. The writer has never tried fuming more than one piece of paper at a time, for fear of uneven action. The paper can now be put into the printing frames without any further drying, as some insist upon.

As to printing, there are few good negatives that can be put out in strong sunshine and give the best results. Exposed either to the light of the sky or to the sunshine tempered by tissue paper on the outside of the frame, the prints will repay the extra time and trouble by increased brilliancy. Very dense negatives, only, should have direct light. All prints are to be darker at this stage, considerably darker; this is one of the keys to success. The toning and fixing bath reduce the strength. Quick printing loses more, too, than slow.

Toning.

It takes the amateur a long time to learn that the tone of his pictures is settled when the lens cap is in his hand or the bulb is squeezed. The exposure and the lighting will make or mar, often beyond any help of the development or anything else that follows after, and when the amateur comes to judge of negatives impartially, he knows just how near he can come to ideal tones. The writer has dallied with a great many toning baths, has found very few unusable and many good ones, and with all of them, this peculiarity, that the best negative always gave the best print.

For trimming prints, which should de done before toning, forms made of galvanized or sheet iron, a shoe-knife for cutting, and a piece of ordinary sheet zinc to cut upon, make a very good combination. For stereos. one has to use the patented holes that go with the Robinson trimmer.

Clippings of silvered paper and prints are to be saved.

For the toning-bath, make up a stock solution of plain, honest gold chloride—either home-made or "boughten"—in the proportion of one grain to the dram of water. No attempt must be made to neutralize this stock solution, not even with chalk or whiting, as a neutral solution will not keep. This is important. Of this stock we may take two drams, and water to make two ounces; put in a slip of litmus paper, and add cautiously, with stirring, strong carbonate of soda solution until the litmus paper turns blue. This is now made up to sixteen ounces with tap water, ten grains of common salt being added, and ought to stand for one hour before use. (In the meantime, the prints can be put through the first washing.) For a dish, a 7 by 9 granite or porcelain will do, since these will stand heat, as this bath is used lukewarm—ninety degrees F. Made up with three or four drams of gold solution, instead of two, it will tone at the ordinary temperature of the air.

Where gas is available the following arrangement will work nicely. A piece of five or six-inch stove-pipe is obtained, eight inches high, to serve as a stand. On both edges four good-sized V's are cut out for ventilation. A Bunsen burner, six inches high, has a metal plug fitted in temporarily and four small holes drilled into the side of the tube at equal distances apart and far enough from the end to clear the plug. Put inside of the stand, this will give four horizontal darting flames when turned on full, but they are needed only one-half inch long, and can be turned down as much lower as desired without striking back. Removing the plug restores the burner to its former usefulness. A small petroleum lamp with burner and chimney, together with a stand as above, would no doubt answer equally well. One soon gets used to the right temperature by the feel, and the dish can be removed if it gets too warm. The two grains of gold chloride will tone two full sheets of fresh paper readily; if under less favorable conditions the toning lags, or if there is a larger batch of prints in hand, some more stock gold, diluted and neutralized as directed in making up the bath, is to be added as needed. Or a little more gold can be neutralized in the first place as a reserve and given a chance to "ripen," and if not needed can be acidified with hydrochloric acid and kept until next time, bottled and labeled as to strength.

Retracing our steps, the prints are to get their washing while the toning bath is ripening. The prints are pressed under the surface of the water—one quart for two sheets—wetting them as thoroughly as may be. They will curl up, but, by the time the last ones are in, can be readily straightened out, and are then left for fifteen minutes. Prepare now a bath of water, one quart, and common salt one-half dram; transfer the prints to this and leave them till they begin to show a change of color towards the reddish shades, then transfer to fresh water, from which they go into the toning-bath. The first washing water may be put into a pitcher or jar, adding about half a dram of sulphuric acid and two drams strong solution sulphate of iron, stirring well.

This precipitates the pure metallic silver which settles in an hour or so as a gray powder and is retained while the bulk of the liquid if poured off at any convenient time. The salt water bath is not saved.

The toning bath being warmed, four prints are put in which will be seen to change to a red tint and then gradually assume the proper tone, which should be judged by diffused daylight. Gaslight toning can be attempted after some experience, guarding against over-toning, however. When these four are about half-toned, four more can be added, and will help the judgment by the contrast of color. The prints are kept moving about and in ten to fifteen minutes the first will be done, when they are transferred to clear water. This bath is capable of yielding a large range of tones, according to length of time immersed.

The gold still contained is recovered in this way. The solution is put into a quart bottle, some ten drops of sulphuric acid added and about one dram of strong sulphate of iron solution, and shaken up; a process very like the treatment of the wash-water. In a day or less, the gold and some silver will be at the bottom of the bottle as a black sediment and the liquid above can be thrown away to make room for the next bath, for

Fixing.

This is composed of hyposulphite of soda and water in the proportion of one to eight. It is handy to have a stonger stock solution and dilute it as required for negatives or prints, as follows: Two pounds of hypo are dissolved in one quart of water in a non-metallic dish. Since the hypo crystals are about half water, the solution will measure nearly two quarts and should be made up to this amount with water, when there will be one ounce of hypo in two ounces of solution. One ounce of salt is also added, which counteracts blisters, and also frilling in negatives. For our use eight ounces of solution are diluted with water to make one quart, which makes the proportion one to eight as above, and ten drops of strong ammonia are added. The prints are put into this one by one, putting the last ones in face downwards to keep all well under the surface. In ten minutes they should be changed about, bringing the lower ones to the surface, one by one, and in twenty minutes the fixing can be considered completed. The prints are now put into one quart of water having two drams of salt dissolved and left there for five minutes. This salt can also be kept in solution and thus be measured instead of weighed. One-half pound of salt and one quart of water will make the proportion one to four, nearly, and for two drams as above, eight fluid drams or one ounce would be taken. The spent fixing solution is poured into a crock or jar of about a gallon capacity and when nearly full the silver is precipitated as black sulphide by the addition of strong solution of sulphide of potassium. The "savory" smell remaining after stirring up is an indication that all the silver is thrown down, and this is further tested by taking a little of the solution when it has settled clear and adding some more sulphide to it and if there is no further precipitate the solution can be thrown away, otherwise the bulk of the solution requires more sulphide.

Washing Prints.

Not that the writer should tell anything about it, since he has not "washed" a print for two years, but recognizing the fact demonstrated by the experiments of experts that thorough fixing in plenty of fresh hypo is far more essential to the permanency of prints than the absolute elimination of the hypo, he has adopted the following simple substitute for washing, and has found it entirely sufficient. From the salt solution mentioned above, the prints are put into a quart of water containing one-half ounce of eau de javelle or other hypo-chlorite, and left for five minutes. Numbers 50, 101, and 102, of standard formulæ, 1887 Annual, give reliable directions—the first apparently only one-third the strength of the others—or the very convenient Flandreau's hypo-eliminator, of the Scovill Company, can be used. The prints are then transferred to another bath of same composition, and left some time, and are then put into clean water to soak for fifteen minutes; this may be a quart of water or more. During all these manipulations it is essential that all prints should have an equal share in whatever is going; they should be handled singly, and also drained somewhat as they are transferred from one solution to the other. After this final soaking, similar sizes are placed one on the other on a piece of glass. I use a piece of good tinsmith's tin instead, and the water drained off and well pressed out.

Mounting.

They are now ready for mounting. For this, starch paste may be used, made as follows: Starch, one dram, rubbed up with one-half ounce cold water, added to one and one-half ounce boiling water. Two drams of wheat flour may be substituted for the starch, and the water-bath plan of making is to be preferred to give smoothness. During the cooling of the paste a piece of glass or other cover on the dish will keep a skin from forming. A hog's-hair brush is used in applying, as this rubs the paste well into the grain of the paper, and does away with the amateurish curling up of loose edges and corners. A burnisher is still too expensive a luxury for the average amateur, and he will depend upon the trade printer or an obliging professional for this service.

In the matter of residues and waste, only the methods of saving have been given; the restoration of these to useful photographic shape will have to be deferred. I have also omitted to state at the proper place that the silvering tray is to be rinsed after use, and this rinsing water may go with the first washing water.

Neither do I dare to tax the forbearance of the editor with detailed directions for the necessary testing of the strength of the silver bath. A method will be found in Wilson's *Photographics*, and a simpler one is described by Mr. W. K. Burton in the *British Journal* of last year (1886), page 795; however, requiring an outlay of two or three dollars for a burette. Hydrometers and argentometers are useless, except for freshly prepared baths.

In closing, the writer hopes he may be of use to his fellow amateurs in what has been written, and assures them that the processes are not so lengthy in practice as they may seem on paper. It has taken extra space to set forth the advantages of being able to clean up the muss after a batch of printing as clean as if nothing had happened, and to leave all apparatus, solutions, paper, and other unconsidered trifles perfectly ready for the next onslaught.

Ottomar Jarecki.

Erie, Pa.

HELIOGRAVURE AND GALVANOGRAPHY.

Some seventeen years ago the necessity of a survey of the territories of the Austria-Hungarian Monarchy and for making new and special maps according to the demands of modern military science became apparent. Simultaneously the very important question was put to the directors of the Military Geographical Institute, of Vienna, "In what manner or by which methods of reproduction shall the new maps be made?"

Well-trained copper-engravers and lithographers might possibly have been procured to do the work, but the enormous mass of material (the new map on the scale of 1:75,000 consists of 720 plates) made the number of the available working forces appear too small, as it was required to publish the new map *in toto* as speedily as possible, so that, when the last plates of the work were printing, those issued first should not be antiquated.

While still considering to which of the known reproduction methods preference should be given, the late Chevalier Henry de Schönhaber, at that time Technical Director of the Imperial Military Geographical Institute, had seen accidentally a print made from an intaglio photo-galvanic copper-plate. Perceiving at once what revolution in cartography would result from the introduction of photo-galvanic copper-plate printing, he decided instantly in favor of it, and communicated with Emanuel Mariot, a photographer of Graz, who had made the copper-plate mentioned, engaged his services for the institute, and, assisted by extensive subsidies, Mariot was enabled within a short time to show the most astonishing results. At the Vienna International Exhibition of 1873, he brought to public notice sample proofs of the new special map which had been made at the Military Geographical Institute by means of the heliogravure process.

The eminent significance of heliogravure not alone in cartography, but to all the graphic arts, was readily understood by practitioners. The new method offering all possible and valuable advantages, without the disadvantages of copper-plate engraving, was consequently adopted by the Military Geographical Institute, and has been practiced there exclusively ever since 1872 for the preparing of printing plates for all permanent atlases and every other kind of graphic reproductions.

Mariot's method with which a gelatine relief, produced by the action of light, is transferred upon a silvered copper-plate, and by means of glavano-plastic processes an intaglio printing plate prepared from it, has been named photo-galvanography. It is to the present day the most perfect process, and the most appropriate in cartography or when it is desired to reproduce old cuts, etchings, pencil or crayon drawings, and in general for reproducing originals of rough or grained surfaces; that is, for line or stipple work.

Printing plates made by this galvano-plastic method result in reproductions with the minutest details and the character of the original. As excellent as Mariot's method has proved to be for the purposes mentioned, it is less applicable for the reproduction of photographs of natural objects; that is, for originals demanding the retention of half-tones and modulation in the copy.

The desire to fill that gap in the process induced numerous experiments, till Klic, in his own laboratory at Vienna, and O. Sommer, of the Imperial Military Geographical Institute, had devised a new method of reproducing. It was named photo-gravure. With it the gelatine film, a negative copy of the original, is printed upon gelatinized paper by the action of light, transferred upon a highly-polished copper-plate, and the picture etched upon it with a solution of ter-chloride of iron.

Hence photo-galvanography is principally appropriate for the reproduction of originals in line and stipple, photo-gravure for paintings washed in India inks, and for photographs of natural objects.

Both of these methods, perfect substitutes for copper engraving, are highly esteemed, as with them works of art of the greatest merit have in reduced dimensions become accessible to people of moderate means, and been instrumental in promoting artistic feeling, taste, and education.

Photo-galvanography has proved to be particularly useful for the reproduction of maps. Regarding the proportions of time and means expended in preparation of copper engravings, compared with those for photo-galvanographs, the facts are about as follows:

The engraver requires for his work an original with but limited details and less carefully executed. It only needs to be correct in the forms of territories and in general character. Cost and time to prepare such an original is about one-half to one-third less then for a heliogravure, which, besides being equally correct, must be executed with all the requisite sharpness and detail, and with faultless accuracy. Time and expenses for an engraver's original will amount for one plate of the new special map of the Austria-Hungarian Monarchy, dimensions of plate being 53 by 63 c. m. on an average; letter-ing and outlining, one month's time, and costs, 100 fl.; topography, three months' labor, 300 fl.; total, 400 fl. Expenses for engraving of letters and outline, and three months' time, 350 fl.; topography, on an average, twenty-six months, 2,850 fl.; total, 3,200 fl.

Photo-galvanography requires, on the contrary, perfectly sharp drawings, executed with the greatest precision. By the experience of the Imperial Military Geographical Institute the preparation of one plate, exclusive of mountains of high and medium altitude, requires on the average twelve months' work at an expense of 1,900 fl. The heliographic reproduction of it, inclusive of the galvano-plastic printing plate, takes, at the utmost, four weeks' work, with an expense of 50 fl. for material, retouching, according to the quality of the original, from eight to ninety days, with an expense of from 20 to 300 fl.

The total cost of making a printing plate, without grading it for enclosure, and any possibly required hatching for waterlines, with eleven and one-half and sixteen months' labor respectively, amounts to from 1,470 fl. to 1,700 fl. Add to this for enclosure, waterlines, and super-revision and correction, from one-half to two months, the cost of a printable plate will amount to twelve to eighteen months' labor, and from 1,550 fl. to 2,000 fl.

But even if nothing was saved on the actual expenses, time is gained to such an enormous degree, that our highly interesting atlas with its 720 plates will be finished and ready for publication at the end of the year 1887.

Had it been intended to produce from 50 to 60 of the special maps in one year by copper-plate engravers, which is now being done by galvanography, at least 150 topographic engravers would have been required to do the work. Extreme difficulties would be encountered to train such a large number of men, and at least four to five years would be required to do the work. Expert pen-and-ink draughtsmen required by the heliogravure process are easier to be procured, and more readily educated.

Heliogravure is not inferior to copper-plate engraving. If the originals are of unexceptionable quality, no graver is capable of excelling in sharpness or in the details of half-tones.

It may not be out of place to mention here that in the year 1882 a plate was made by that process at the Imperial Military Geographical Institute of Vienna for the United States Government. It was a map of Lake Tahoe, in Virginia, of the dimensions of 66x82 c. m. With the consent of the Austrian Ministry of War, the American Major Winter studied and practiced for several weeks the photo-galvanograph process.

I will now proceed to describe both of these heliogravure processes more in detail.

I.—For the photo-galvanography process, a reversed photographic negative on glass, a copy from the original India-ink drawing, is required. It should be reduced to four-fifths or three-quarters of the original dimensions, as then a much sharper, clearer, and more delicate reproduction can be secured. In the next place, pigment gelatine paper will be wanted, which is prepared by spreading a sheet of good photographic paper upon a leveled plate-glass and coating it correspondingly thick and uniform with the pigment gelatine solution, which consists of Nelson gelatine dissolved in water, with sufficient sugar and the successive adding of fine lampblack (gas russ), alcohol, ammonia, and creosote. As soon as the gelatine mixture has set, the coated sheets are hung upon cords, and, after drying, are kept in a perfectly dry room The quantity of the pigment to be added to the gelatine is proportioned to the character of the original to be reproduced, one-tenth of it being the maximum, one-quarter the minimum, the former for fine and delicate drawings in line manner, the latter for other work. The pigment papers prepared in the manner described are afterwards sensitized in the dark-room with a bichromate of potassium solution 1:15. Removed from the sensitizing bath, the paper is laid upon a carefully cleaned plate glass, with the film side down, and dried as rapidly as possible, in a strong current of air from a fan-wheel set in motion by a gas-engine, an operation which requires from two to four hours. Immediately before using it, the paper is to be detached from the glass plate.

The exposure to light under the reversed glass negative is effected in an ordinary printing frame, with a wide tube attached to it, to allow only vertical light to act. Correct time of exposure is adjudged with the aid of a Vogel photometer.

The light acting upon the gelatine has changed its nature, has made it insoluble in warm water, while on the non-acted-upon parts the solubility has not been altered.

After printing is completed, which, according to the quality of the negative, is indicated by reading sixteen to twenty photometer degrees, the insolated sheet is removed to the dark developing room, and, under water, transferred upon a silvered copper plate, picture side down. After removing the plate from the water bath, the sheet is squeegeed upon the plate and blotted off with bibulous paper. After resting about five minutes, the plate is immersed in another cold water bath, which washes away the non-acted-upon bichromate of potash, softening at the same time the paper support. In half an hour the plate is removed, rinsed off well, and transferred to a warm water bath of from 100 to 115 deg. F., which dissolves the unacted-upon gelatine and causes the development of a gelatine relief upon the silvered copper-plate. Water enters at once the pores of the paper, and blackened gelatine oozing from it indicates the progress of the developing process. In about half an hour the solution of the gelatine has so much progressed, that either the paper will float upon the bath or can be lifted up with a slight force. Naturally, that should be done with great care, so as not to injure the relief beneath it. After another ten or fifteen minutes' soaking, all soluble gelatine will be taken from the plate, and a relief in form and shape of the original drawing be developed and standing distinctly and clear upon the plate. The final development is done in another bath of warm distilled water, till all fog, foreign matter, etc., have been entirely removed from the interstices of the relief, leaving a clear and distinct image upon the plate. At last the plate must be washed with cold distilled water, and dried spontaneously, which requires from ten to twelve hours.

The gelatine relief adheres firmly to the silvered copper-plate, and is as hard as steel.

To make the relief plate conductive, powdered graphite is spread over it with a tampon and soft brush, and the graphited plate placed on the poles of a Daniell trough apparatus and the precipitation of copper promoted by means of a zinc anode. Within three-quarters of an hour, or an hour, the heliographic relief plate has been sufficiently covered with a copper precipitate, when the apparatus can be opened and the plate removed, rinsed off to remove foreign matter from it, and again returned to the trough, but for continued activity of the electric current an iron anode is substituted.

The relief plate remains now from twenty to twenty-four days in the apparatus, or till the copper percipitate has gained sufficient thickness; is then removed from the trough, rinsed with water and dried; the edges are filed off and the cast removed from the matrix. Both plates are well washed and parts of the gelatine relief remaining are carefully removed.

If the plane of the heliographic gelatine relief has been perfectly clean and free from any tone, the intaglio plate will be smooth, lustrous, and printable. Matt or dull stains may be easily removed by wiping them off with flannel moistened with oil and rotten stone. Tone or impurities in the copper precipitate are taken off by scraping and burnishing.

Proofs taken from these plates will show all imperfections, if there are any. Tone gradations are generally well reproduced, if original drawing and negative have been correspondingly good. If finer tones are wanted they are worked in with the cold needle, more striking effects may be produced with the graver, and half tones regulated with the burnishing tool and graver.

The first proofs taken from heliographic plates are always somewhat coarse, and only after a number of impressions have been pulled off, can evener and more brilliant prints be secured. First impressions should not lead to premature retouching. If any corrections have to be made, an expert copper-plate engraver can do it easily. Before large editions are printed from a perfect heliographic plate it is usual to take from it a reserve or depot plate; a galvano-plastic relief copy of the intaglio copper-plate. The same is also done with plates produced by other methods, whenever large editions are to be printed. If in course of time and by frequent printing the plate begins to wear off, caused mainly by rubbing in the ink, resort is made to the relief depot plate and a new galvano-plastic intaglio taken from it.

For plates which will never require corrections or alterations, like reproductions of works of art, the above described and most important mode of multiplying them by galvano-plastic process may be replaced by another not less efficacious, by steel facing. When the copper-plate, suspended in a solution of sesquichloride of iron, is placed on the kathode, and subjected to the action of the galvanic current, it will be shortly covered with a delicate and lustrous cuticle of iron as hard as steel and so extremely thin that not the remotest difference can be observed between proofs taken from a plain copper or a steel-faced plate. The iron precipitate gives the plate a great durability, and it resists the pressure caused upon it by inking, so that thousands of impressions can be made from it. The advantages offered by the process of steel facing the plate extend still further. If, after long use, the steel shows signs of wearing off, it can be removed and the steel-facing process renewed. The plate is then laid in sulphuric acid, diluted so much that it will not attack copper; it loosens, however, the steel which will finally come off in minute scales. Before the plate is again steel-faced, it must be carefully washed in pure water.

II.—O. Sommer's photo-gravure process requires a negative of the same quality as that for silver printing. A diapositive upon glass is made from it by means of pigment paper, prepared with soft gelatine, very fine lamp-black, and to prevent an excessively high relief the addition of a sufficient amount of sugar. This positive picture can be retouched quite satisfactorily with neutral tint and lead pencil. From this positive matrix a negative is made upon pigment paper and transferred to an asphaltum-grained copper-plate, preferably rolled copper, resulting in a delicate and fine relief picture, which is then etched into the metal with terchloride of iron.

After the first or preliminary etching has been done, and the plate been detached from the gelatine relief and asphaltum grain, a very feeble and monotonous image only is visible. A second, a third, or still oftener repeated etching gives the plate the desired vigor and strength.

To accomplish this, the surface of the plate is carefully inked with a smooth and even leather roller, with fatty ink, which resists the action of the acid etching fluid, and for the purpose of closing up all ink particles the plate is slighly warmed. All the more delicate tones of the plate will then be covered with ink, those near to them, requiring deeper etching, remain open, and the plate can be subjected to the etching fluid for another two or three minutes.

With a repetition of the procedure, the amount of ink upon the roller, the pressure used when pulling it over the plate, and the time of etching must be doubled. For a third or, eventually, a fourth etching, the plate is inked in such a manner as to keep open only the intensest, the most effective parts, and etched again for three or four minutes.

Well-exposed negatives, full of details in the deep shadows, assist materially in obtaining good and satisfactory results.

These two reproduction methods are practiced in the Austrian Empire, at Vienna in the Imperial Military Geographical Institute, the Imperial Court and State printing house, and by the firms Victor Angerer and Josef Löwy.

Ottomar Volkmer, Lt.-Col.

VIENNA, Austria.

LANTERN SLIDES AND TRANSPARENCIES.

DURING the dull, cold days of winter out-of-door photography offers few attractions. The amateur living out of the city can occasionally get very pretty snow effects, but very generally with the disappearance of the leaves from the trees and the warmth from the sunshine we put up our cameras and devote ourselves to some other work than making negatives. Lantern slides and transparencies are worthy of our attention, and if we wish to use plates of our make for the purpose, rather than the excellent ones offered by the trade, the preparation of these and their subsequent use will enable us to keep our hands in, at least as far as printing and toning go.

Some time ago I came across the following formula and directions for an emulsion, and have made plates which gave tones of very superior quality, in the making of which I have whiled away the tedium of long winter evenings.

The papers which I sent some time ago to the *Times*, upon "Dry Plate Making for Amateurs," were intended to record my experience in that line, and to them—since published in pamphlet form—I would refer any amateur who may wish to obtain information as to the preparation of the glass, the coating of the plates, and their drying.

The emulsion which I used for the transparencies was original with Mr. Henderson, and I forget the source from which I copied it. Here it is:

A.

Soft gelatine	40 grains.
Acetate of soda	8 grains.
Water	2 ounces.

First dissolve the soda in the water, then add the gelatine and place the vessel containing the solution in warm water to melt the gelatine.

B.

Nitrate of silver	28 grains.
Water	1 ounce.

Add this solution to *A* when the gelatine has melted, and shake well.

C.

Chloride of sodium	4 grains.
Acetate of soda	6 grains.
Water	1 ounce.

Dissolve and add to *A B*, with thorough shaking.

D.

Hard gelatine	160 grains.
Water	3 ounces.

Soak for fifteen minutes, then pour off the water not absorbed by the gelatine, and add to *A B C*; put the vessel containing the whole mixture in water at 100° F. till the gelatine is melted and incorporated, then set aside in a cool place to become stiff. It is well to leave it twenty-four hours. All these operations can be safely performed in ordinary gas-light. At the expiration of the above-mentioned time, remelt the mass by placing the vessel containing it in hot water 100° F., add half half an ounce of alcohol, and water to make it measure six ounces. Filter this through fleecy cotton or absorbent wool, and you have your emulsion ready to flow over your plates.

The plates of course are thoroughly clean, and laid upon a perfectly level slab.

You can either coat by flowing, as in varnishing, or by means of the glass rod as in the ordinary emulsion. Gas-light is quite safe to use. The emulsion is nearly colorless, and you must look sharply to see that you have thoroughly covered your glass. Dry in a drying-box in the usual way, or in any light-tight, ventilated cupboard or box.

Even when dry the plate is very nearly transparent. The drying should be completed in twenty-four hours.

To print, place your negative first in an ordinary printing frame, film side up, and the plate in contact with it, film to film, and according to the density of the negative expose to diffused light or direct sunshine. Continue the printing till the positive, as seen by looking at its back, is a deep orange-brown in the shadows, then remove from the frame.

The appearance at this stage is not beautiful; a dark orange-red in deepest portions shading off to straw color. Wash for a few minutes in water, and then place it in a toning bath containing one grain of gold to each eight ounces. I use my ordinary acetate of soda bath.

The toning is generally very slow, but you can ultimately get a rich, deep purple. When this is obtained remove from the bath, wash again for a few minutes, and then put the plate in a fixing bath of about half the strength used for negtives. Leave them until the high lights are clear—which will take fifteen or twenty minutes—then wash thoroughly for an hour at least, and dry.

If you have been successful, you will have a beautifully soft positive, of a rich brown or even purple color, which when tastefully mounted and placed in a good light makes an exceeding pretty picture.

If you have plenty of time on you hands, and nothing more pressing to do, I advise you to try making the above. It will pay you for your trouble, and the fact that you can work in ordinary gas-light removes one of the principal objections to dry-plate making.

Geo. L. Sinclair, M. D.

HALIFAX, N. S.

"AMATEURS," "PROFESSIONALS," OR "PHOTOGRAPHERS."

Readers of Photographic journals may well be weary of discussions as to what constitutes an "Amateur" and what a "Professional" photographer. The subject has been argued and re-argued from every standpoint, and so far as I have seen, no satisfactory line has yet been drawn.

But what sensible reason is there for drawing a line? Why should a separation be made between those who are seeking the same object in a legitimate and worthy manner, and whose efforts are directed towards the advancement of the same science?

A man of leisure takes up the study of photography for the pleasure derived from it, as he would literature, chemistry, natural history, or art.

A man of business seeks recreation in the same pursuit. Another makes it his means of livelihood. In these days, it is possible for all to attain results worthy of their highest efforts.

The quality of the work depends but partially on the expense of the tools, or the amount of time at one's disposal. These elements govern quantity, but for quality we must look to "the *man* behind the camera." Our exhibitions have proved that equally good work may be done by all who use taste, ability, and determination. In some lines of work one class has an advantage, and in some another, but in our societies, at our exhibitions, and in our business relations, all who have truly at heart the advancement of photography as an art and as a science, are equally worthy of respect. All such are *photographers*, and by this term only should be known.

Those who make pictures by brush or pencil are known as artists. At exhibitions of paintings do we hear anything about "amateur" or "professional" painters? If we ever do hear the former term, it betokens one whose work is very low in the scale; and so it seems to me the significance of the term "amateur photographer" is tending rapidly.

While the number who take up the art in the right spirit and study it carefully with a view to full understanding and perfect work, is no doubt rapidly increasing; the fact remains that gallons of ready-made "developers," "intensifiers," etc. are sold by dealers, and but a small proportion of those who own cameras and "outfits" can print their own pictures, or even develop their own plates with any certainty as to results. These are the "amateur photographers" of to-day, and as such they are unworthy of notice, and need not be heard of, or from, in public. As an English writer recently put it, they want "a little race all to themselves" at the exhibitions, with dear little medals or diplomas "for amateurs only." In a contest which is other than child's play, what are such awards worth ?

It seems to me the time has come to draw the line, not between friends, but between those honorably bearing the name of photographers, and those whose right thereto come only "by purchase."

Robert S. Redfield.

PHILADELPHIA.

THE ELIMINATION OF HEAT FROM CONDENSED LIGHT.

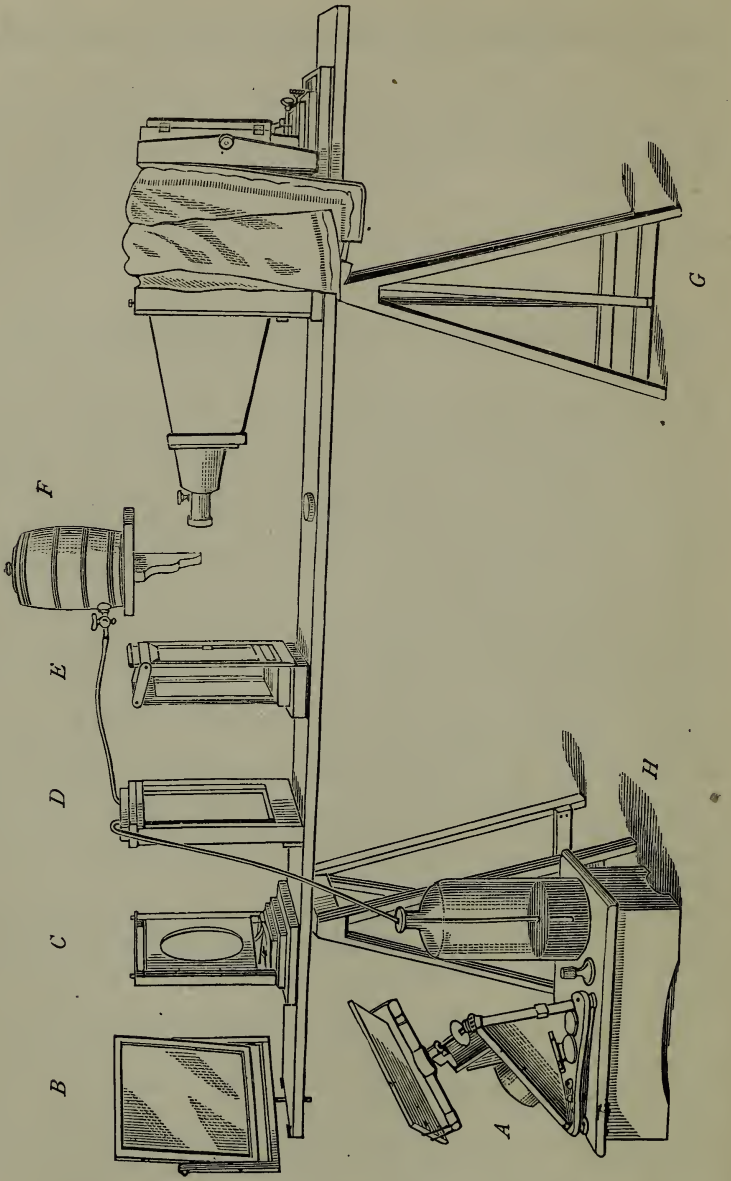
In a recent conversation with several students of science who use photography in their investigations, the subject of heat and the best means for its elimination from condensed light, was, to some, the most interesting point discussed. The method which I devised some years ago, and have since successfully used at the photographical laboratory of Bellevue Hospital, met with such favorable comment that I was requested to furnish a description for publication.

As there is no better channel through which to fulfill the promise then made, and at the same time reach the greatest number of my fellow workers, I herewith transmit illustration and description.

The illustration shows the component parts of the apparatus in their *relative* positions, though not in the exact proportionate distances at which they are usually placed for actual work. To make the description short and explicit each part is designated by a letter, and referred to by name also, when deemed requisite for better understanding the relation of each to the whole.

The parts *F*, *D*, and *H* constituting the heat eliminator are the only portions of the apparatus requiring detailed description more than to indicate the proper positions for the other items when used.

F, a vessel of earthenware or glass is nearly filled with a solution of ammonia-sulphate of copper, which is carried into the glass cell *D* through the rubber tube shown in the cut, the flow being regulated by an ordinary stop-cock. This cell is made up of two one-quarter inch sheets of colorless plate glass 14 by 18 inches in size; these two glasses are separated by a rubber gasket three-eighths of an inch thick and one inch wide, thus leaving a space or receptacle for fluid three-eighths of an inch by 12 by 16 inches. Through the



top of the gasket pass two short tubes for attaching the receiving and discharge pipes, the latter leading into a bottle or other vessel at a lower level, as shown.

The plates of glass and rubber gasket are clamped by wood screws passing through an oak frame on each side, the whole is then set in an open-sided case sufficiently large to give stability. The ammonia-sulphate solution is allowed to flow from *F* through *D* into *H* at such rate as may be desired for the purpose designated. The relative positions of *C*, *D*, and *E* should be such that the light from the heliostat (*A*) or other source of illumination—when reflected from the secondary mirror (*B*) and condensed by lens (*C*) will just cover the desired portion of object or negative in the adjustable slide nearest the camera in the double frame (*E*). The back frame of this part of the apparatus is used for carrying a ground or tinted glass as is found desirable for the work. The whole of this double frame is adjustable across the field of the lens. *D* should occupy a position as near *E* as convenient. When only white light is required, plain water will answer for the heat eliminating fluid.

The temperature of the liquid in *F* should not be far below that of the operating room, otherwise condensation on the surface of the glass cell may interfere with the transmission of light. All parts of the apparatus should have provision for vertical and horizontal adjustment to coincide with the axis of the objective used on the camera, which is moved forward or back along the base supporting the whole system.

Valuable negatives and specimens are often lost by overheating from condensed light while attempting enlargements requiring long exposures; as in deeply stained animal or vegetable tissues, in their natural condition or prepared for chemical or optical examination.

When enlargement is required from part only of a negative —one figure in a group, or a head and bust from full or half-length figure—there is great danger from unequal heating, if the light is condensed only on the part wanted. It has been fully demonstrated that by the method described, all risk and danger from such a source is avoided.

O. G. Mason.

NEW YORK.

A NEW DEVELOPER.

I have recently been using the following developer with excellent success. It gives brilliant, quick printing negatives of a color similar to oxalate.

No. 1.

Pyro	1 ounce.
Sulphite of soda	8 ounces.
Metabisulphate of potassium	1 ounce.
Water	16 ounces.

No. 2.

Carbonate of soda	8 ounces.
Water	64 ounces.
Bromide of potassium	160 grains.

Use	No. 1	1 ounce.	Normal.
	No. 2	1 ounce.	
	Water	2 ounces.	

The quantities of Nos. 1 and 2 for use have to be varied according to exposure and nature of subject.

The metabisulphate of potassium is a chemical that seems to be unknown, some eminent chemists even going so far as to say that potassium does not take that form, and I know of no place where it can be purchased.

It is the best preservative of pyro that I have run across, and the negatives come out bright and clear, and the pyro does not stain the fingers, which latter consideration to me is very important, as I have gotten tired apologizing for the appearance of my hands. I find it works especially well on the Eastman films.

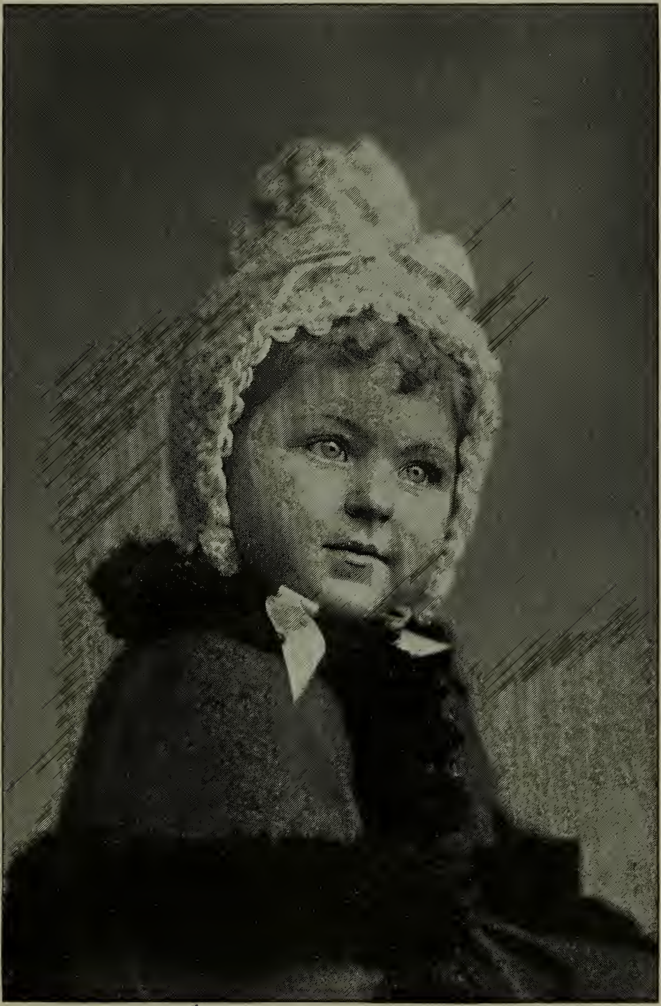
I put up half an ounce of pyro with sixty grains of citric acid, and half an ounce of pyro with half an ounce of metabisulphate of potassium, sealing them both at the same time. That put up with the citric acid is a very dark red, while the other is as bright as the day it was put up.

John E. Dumont.

Rochester, N. Y.

THE DETECTIVE CAMERA FOR NEWSPAPER PHOTOGRAPHY.

One of the most important directions in which photography is now beginning to make itself useful is in the way of newspaper illustration. Undoubtedly the newspaper of the future will be illustrated, not with a few scattering outline cuts like a schoolboy's first attempts at drawing, but with pictures containing all the detail and half-tones of a photograph. These will



PORTRAIT.

Specimen of Ives Process Engraving, by the Crosscup & West Engraving Co.,
907 Filbert Street, Philadelphia, Pa.

be sent by wire the same as messages and put into a stereotype without redrawing. However, the ANNUAL wants facts, not prophecy, and I hasten to give a few.

Undoubtedly the best kind of camera, by far, for newspaper work, is the Scovill Detective, and it could be made still more serviceable with a few alterations. The lens should not be less than six inches focal length, and one of seven is better, as the bulk of the views will be taken at not over forty feet distance—about the width of a street, between curbstones. At that distance, with a six-inch lens, a man will be only an inch high, but, if the picture is sharp, it will bear enlargement, so that a fair likeness can be obtained. If a shorter focus lens is used, the perspective of distant objects, buildings, etc., is much distorted, and it is necessary to be inconveniently close to obtain portraits. The nearer the object, also, the faster must the shutter be worked to obtain a sharp picture, and the shorter, therefore, will be the exposure. The zinc process, which is chiefly used for illustration on daily newspapers, is so slow that it is difficult to make the pictures and stereotype them the same day. A great saving in time can be made if the artist will take the photograph in the first place of the size it is to appear in print. A column of the Chicago *Tribune*, for instance, is two and three-eight inches wide. Suppose it is desired to reproduce a house where a murder was committed, and the face of the murderer. By a simple rule of proportion it will be found that the photographer must be seventy-three feet away to get a picture of a house twenty-five feet wide within two and three-eight inches, and to get a portrait of a man's face one and one-half inches high, so as to show the features well, the subject must be only twenty-eight inches from the camera, using a six-inch lens. Having prints from these negatives, then, of the size wanted, all the artist has to do is to ink the outlines over with a pen and India ink, remove the photographic image by dipping the print in mercuric bichloride, and then hand it over to the engraver, who takes a wet-plate proof, transfers it to the zinc, and etches it in the usual way. In such cases the probability of getting good pictures, especially portraits, is at its maximum, as the personal equation of the artist's skill or ignorance is almost entirely eliminated. As, however, either through ignorance or carelessness, or sometimes where it is really impracticable, few pictures are taken of the proper size, they must either be enlarged or reduced to the Procrustean bed of the newspaper column by free-hand sketching; and in the press and haste of journalistic work it is no wonder that many of the illustrations show such wretched work. Great improvements might be made by the use of an enlarging camera and a pair of condensing lenses. A bromide print could be made in a few minutes, or the camera might be used direct. At the back of it a mirror could be set at an angle of 45 deg., and the picture, enlarged or reduced, as occasion demanded, from the original negative, could be thrown upward on the ground-glass, placed horizontally. With tracing paper, a copy could then be made much more accurately and quickly than by free-hand. A pantagraph could also sometimes be used with advantage for the same purpose. Another difficulty which it is far more difficult to obviate, is the distortion produced in stereotyping. As is well known, all the great dailies are printed on cylinder presses—the Bullock or Hoe. From the original type, as set up, a matrix or impression is taken, and this is put in a cylinder whose curvature is the same as the cylinder of the printing press. This bending or curving of the matrix produces a distortion in a portrait similar to that of a concave cylindrical mirror, shortening all perpendicular lines, and quite altering the proportions of a man's features.

As the Scovill Detective must be in the future an almost indispensable adjunct in a newspaper office, it seems to me the following changes will improve its efficiency: The lens, as I have said, should be six or seven inches focus, instead of five; the lid should be made so it can not fall back more than 90 deg., as it is often used as a handle when opening the box to change a holder. The lever on the under side, used in focusing, should be set not with a screw, but by a knife edge falling into a groove so that the distance could be regulated by one hand without turning the box upside down. Five adjustments for focus would be sufficient for ten, fifteen, twenty, thirty, and infinite distance, and these could be indicated beside the grooves into which the knife edge and the lever fell, by five pins of different heights, opposite the ends of the grooves, so that the hand, by feeling, could adjust the focus for any required distance. The shutter arrangement is all that could be desired, and exceedingly simple in its working. A table showing sizes of given objects at various distances, would be a well-prized luxury and very valuable.

Henry L. Tolman.

CHICAGO.

PHOTOGRAPHIC CHIPS.

1st. Paint the ends of the printing frames with black-board slating, and with crayon write the number of the negative on each frame. It is very convenient when printing.

2d. A very good clearing solution is always on hand for those that make tintypes, as well as negatives. Wash the negative for two or three minutes after fixing, and then flow with wet-plate developer.

3d. In silvering albumen paper, to prevent the edges from turning up, procure two sticks one-half inch square and nearly as long as the paper to be silvered. Lay one on each side of the sheet as soon as it is on the bath. Let them remain only a minute or so. It saves blowing, and, if the paper is very dry, prevents profanity.

4th. After fuming, the albumen paper should be rolled on a roller, each sheet separately, and over all wrap soft paper. This plan protects the paper from the air, and it will remain white for several days, even in warm weather.

5th. To save over-printed proofs, after toning and fixing, immerse them in water, one quart, to which has been added ten grains of cyanide of potassium and ten minims of liquid ammonia. When light enough, remove and wash thoroughly.

Another—after fixing, add a small quantity of cyanide to the fixing-bath. Leave the dark prints in till light enough.

6th. Test the dark-room window for actinic light by laying some opaque body in the center of a dry-plate. Expose for two or three minutes. Develop, and you will be surprised to find that a good negative has been obtained in that time. The part covered will remain clear after fixing, if not developed too near the window.

J. R. Swain.

NEWPORT, IND.

PHOTOGRAPHING IN JAPAN.

TRAMPING through Japan some ten or dozen years ago, when a lusty lad of fifty or thereabouts, I took great delight in associating as closely as possible with the native villagers and country people, watching their ways of doing things and trying to get at the true inwardness of many little arts, so simple to them, but so full of mystery to the foreigner.

Of course, I took my 5 by 8 camera and a supply of collodio-bromide dry-plates along with me, and I well remember how, before leaving home, I hugged myself with delight in anticipation of the surprise and astonishment I should see in the poor, unsophisticated Japanese when they saw me take a picture of their houses with themselves standing in the foreground. How little did I suspect that at that moment there were more than three hundred native professional photographers in the city of Tokio alone. This fact I afterwards learned from Mr. S. Cocking, an English stock dealer, who had that number of names upon his books.

There were, however, in the small villages, remote from the coast, whole communities to whom the mysteries of the camera had never yet been revealed. People who had never been told to "look pleasant" and to "wink as often as you like."

One day, after a hard ride, I pulled up at one of these villages for rest and refreshment, and, after a short nap, unlimbered my camera, and with my interpreter, went out for such game as the place afforded. Tattooing is a very common practice with the Japanese, and, though I had seen some fine specimens of the art, I had as yet had no opportunity to fire a shot at one. This chance seemed now to be at hand, for through the open door of what appeared to be a blacksmith's shop I caught sight of a finely-formed and entirely naked young fellow, splendidly emblazoned from head to foot with red and blue dragons, warriors, and maidens. I lost no time in saluting him and in making him aware of my great admiration for his external decorations. Through the efforts of my interpreter he consented to stand for his picture. Selecting a sunny corner, offering a picturesque background, I at once got him into position. His tawny skin glistened in the sun like satin, and his splendid figure would have served as a model for Apollo. I was excited, and it seemed as if I never should be able to get things ready for the exposure.

A crowd began to collect, and before the camera was on its legs half a hundred curious spectators had gathered around me to observe the strange proceedings, laughing and chatting like so many children. Drawing a fine bead on the vertebræ of my subject, I was in the very act of immortalizing him when a shrill voice rising above the tumult and at some distance behind me caused a dead silence. Without a word, or even a look of apology or explanation, my picture gallery quickly left his place and me in the lurch at the same time and did not make his appearance again.

I subsequently learned that the owner of the shrill voice had simply warned her son that he was in danger of some sort of witchery, and that he had better get away while he was able to do so. Hating to lose so fine an example of the art of tatooing, I directed my assistant to make an arrangement with him for the next day, but I was told that no inducement that could be offered would be great enough to make a Japanese son disobey the expressed wish of his parent.

I saw good specimens of the art every day, but none that compared in gorgeousness with that on this dutiful son.

W. H. Metcalf.

MILWAUKEE.

PHOTOGRAPHY BY LAMPLIGHT.

THE taking of photographs by gaslight is as simple as sunlight photography, and the same rules apply to it. The principal rule is, "Never allow the light to shine direct into the camera." I have found that darkening the shade or globe on the side toward the camera will permit the gas globes to be included, but the safest rule is to use lamps if the gas fixture is to be taken in the view. Placing the lamps on a line with the camera and using white paper reflectors judiciously, a very clear negative can be obtained. My first attempt in this line proved very successful, and the negative is equal to one taken by daylight so far as detail is concerned. As to lighting, it is superior, as I could adjust the light to suit the subject.

The light used was one of the so-called "Electric" lamps, and two gaslights turned full up; the lamp being a few feet to my left and the burners almost directly in front of the camera, but out of range of the plate.

The lens used was a Darlot wide-angle, with a large diaphragm. Exposure, forty minutes, and the result gratifying. For portraits, I find that a screen of cepa-skin paper, placed before the light, gives a very soft light. Proper screening and reflecting will give some very fine effects. The plates used were, of course, very rapid (Cramer No. 35), but the same method of handling and developing as for daylight negatives was adopted.

I am sure your readers would find this a source of considerable pleasure during winter evenings, and to become fascinated have but to make the experiment.

Robt. E. M. Bain.

ST. LOUIS, MO.

A TALK TO BEGINNERS.

I HAVE had frequent opportunity to talk to beginners in photography, to advise and instruct them in many different directions, and have in fact done it at the pre-historic daguerreotype time, the transition period of paper and albumen negatives, during the golden era of collodion, up to the present, the instantaneous and drop-shutter epoch.

Collodion has to its dying days (it is not quite dead, however,) kept up an exclusive and aristocratic bearing. Comparatively, only a few chosen men had gained proficiency with it; their work was greatly admired, for it was good, and they will be kept gratefully in our memory. As we must confess mournfully, the days of collodion have nevertheless passed; the ethereal fluid was forced from its elevated position by the great commoner, *glue*, the photographic democrat, the revolutionist, the anarchist, as the orthodox collodion operator may well call it, for with its advent all existing laws of the dark chamber, and the tenets of the black-finger art were annihilated, were negatived, and no positive rules in picture-making have been adopted or proclaimed since. Dr. Maddox has made photography accessible to everybody; he has given us the means to depict any thing that can be seen—has levelled all those appalling and unsurmountable difficulties we encountered heretofore, and has made all things photographic, quite easy generally.

Is it then to be wondered at, that with the great facilities offered, everybody resorts to the new art (?) as a source of pleasure and pastime. And so it has come to pass in our time that the camera, known but recently only as a physical instrument, has become a utensil in every household, an aid to the scientist, a toy to the rich, a recreation to the poor. All these people make photographs—but how?

If a camera has come into the hands of a young enthusiast, no matter to what stratum of society or education he may belong, what possible advice in every direction he may have received, physical, optical, chemical laws explained to him to your heart's content, and he is then allowed to go out picture-making at his own will, what will his first efforts be directed to? Grandma in the rocking chair, the baby, old dog Tray, and an almost impossible group, not to talk of a race-horse going 2.10, an express train, or a flock of pigeons on the wing. Portraiture and instantaneous views will always be the great and first desire of every beginner. Some of them take up camera and plate without the remotest consideration of what they have been told, or what they have read; they will not budge one inch from preconceived ideas or prejudices. With them photography consists in the art of releasing the shutter. They point the machine at any thing they see, without considering conditions of light or paying the remotest attention to physical or chemical law. Hence a multitude of failures, great disappointment, and doubt of the good qualities of excellent and expensive apparatus.

With the many opportunities offered to me to instruct and advise beginners, were they old or young, full of academical learning or far from it, I have always thought it to be my first duty to explain what can possibly be expected from first efforts, how far to extend them, and how far the capabilities of their apparatus will reach. Everybody will concur with me that first efforts should be made with inanimate objects and comparatively slow plates. A very few rules given, if strictly followed, will give results approximately satisfactory to the beginner. Expose your plate upon a brightly illuminated landscape, an architectural subject, or the like, develop the plate with a good commercial developer, and a tolerably good negative will be the result. A slight success encourages, a total failure dampens, all enthusiasm.

With the desire to make other than still-life pictures appears the first difficulty, the handling of highly sensitive plates in a dimly lighted room. Plates allow a very non-actinic light only, under which but very little can be seen, and require afterwards an entirely different treatment than those used heretofore. Very short or instantaneous exposures will always leave a doubt with the operator as to their being correct, and we can not develop them with solutions of known or normal strength; we must alter their proportions, and the mode of applying them to the plate in a variety of ways. We commence the process with more of the alkali when an under-exposure is suspected, and with a greater proportion of pyro in the opposite. Doubtless most of the formulæ we have been advised to work with are good, but in many cases they must be modified to suit exigencies; we must add a little more here to retard that, or take a little less of the other substance to obtain effects wanted, so that the developer in which the plate rests at the last stage of the process, is very far from being any thing like what the formula tells us. In the pursuit of my business as an instructing photographer I am compelled to resort to all sorts and kinds of developing, and the necessary solutions to make compounds for seven or eight different formulæ, are always on the shelves of the dark-room. But the formulæ are not followed strictly, they give a general outline only.

Not long since we had a note in *Photographic Times* speaking of the old mustard spoon formula, that has been so much condemned on account of its want of precision in weight and measure. But who will deny that most of our developing is done in the same arbitrary manner, to suit plate, subject, exposure, and what not? We must, of course, except here the work of the professional portraitist, who exposes all day long plates coated with the same emulsion, works with the same objective, under similar conditions of light and photographs objects virtually alike in the main. The landscapist encounters more difficulties, but much more so the amateur. The latter, whose efforts are directed towards the most heterogeneous objects, deserves much more credit for average good work than he who works steadily under the same or similar conditions.

Excellent work has been done with all alkaline developers, with ammonia, soda, or potash, and for either of them particular merits have been claimed. The portraitist obtains with ammonia better plasticity and finer details in the shadows, which is certainly endorsed by all who have worked with it. Soda claims to give better intensity and general good printing qualities; while potash is evidently the most energetic of all. It may not be out of place to give here a formula with which, when modified as exigencies demand, extremely fine instantaneous work has been done upon any plate of average good qualities:

A.

Water	12 ounces.
Pyro	1 ounce.
Cryst. sulphite of soda	2½ ounces.
Bromide potassium	¼ ounce.
Citric acid	60 grains.

B.

Water	12 ounces.
Cryst. sulphite of soda	2 to 3 ounces.
Carbonate of potash	3 to 4 ounces.

Take 3 drams each of A and B to 4 ounces of water.

Ferrous oxalate has held its own on the continent of Europe, and while we have discarded it for general work altogether in this country, we have seen very beautiful pictures made with it in Germany. The developer is, however, subject to as many variations and modifications as the alkaline pyro. In some processes we must resort to it exclusively; it gives us the best results in black and white lines, in transparencies and lantern slides. If for the latter we exclude the collodion process. Permanent bromide paper, to give the best results, can only be developed with iron. Various formulæ have been given for each and all of these processes, but they amount to about the same thing, for modifications have to be made to suit circumstances. We are told to commence developing with oxalate of potassium and a small proportion of iron, which must be increased as the process goes on, or to use in the beginning old, partly oxidized solution, followed with fresh, and use the bromide of potassium at discretion. For the developing of permanent bromide paper I have dispensed with the use of bromide of potassium as a restrainer altogether. If an over-exposure becomes apparent, I remove the normal oxalate, flood the print with old developer or plain oxalate of potash, and add the normal solution gradually. In this manner much better tones may be procured with over-exposures, than those greenish or olive colored prints resulting from excessive use of the potassium bromide.

Ferrous oxalate has certain advantages over pyro in the developing of American films. Occasionally the pyro will harden or tan the soft gelatine substratum, when the paper support will not detach from the film, even if heated to boiling point. With the iron developer the paper and film will keep clear and colorless, and may be detached by immersing in water not far above the ordinary temperature.

A majority of photographers hesitate, from some unaccountable reason, to confess to their intensifying of negatives. Nevertheless, many of them do it regularly. A professional, of high reputation and favorably known for the good quality of his work, said that he intensifies nine out of every ten negatives made. Formulæ for intensifiers abound; that of Mr. Edwards, with mercury and iodide, is much more used than generally believed, for it is easy to handle; that with mercury and ammonia is probably the most popular. That with mercury and sulphite of sodium I prefer on account of its controllable energy, and the permanency of its results.

The methods with gallic or pyrogallic acid and silver, and all their curiously composed variations, may work very well with some, but I can not conscientiously advise a beginner to use either of them. An imperfectly washed negative would be irretrievably lost, when brought in contact with them.

Washing of gelatine negatives has to the present day not received the attention due to the subject. We have considered the making of negatives with the utmost care, from their incipiency, from the purchasing of the plate upon which we intend to make them, but have neglected the last operation by which we make it durable even, not to say permanent. To give a negative permanency, it must be washed after fixing till all injurious salts may be removed. To do so by chemical means, no better device has ever been given to us than hypochlorite salts, principally the hypochlorite of zinc in solution.

A well washed gelatine negative will keep as well as any made upon other carriers of the sensitive haloids, but it should receive equal care in all operations and manipulation in order to meet with success. The beginner or young amateur can not be enough impressed with the necessity of doing so, without which being strictly followed he will never rise above mediocrity, no matter which particular branch of photography he may have chosen.

Charles Ehrmann.

NEW YORK.

TEMPORARY BINDING FOR PHOTOGRAPHIC JOURNALS.

It is a difficult matter for most people to keep a set of journals together for more than a certain time; they get lost, strayed, or stolen, in most mysterious ways, unless some means be employed to prevent.

.A simple method of securing this end is as follows:

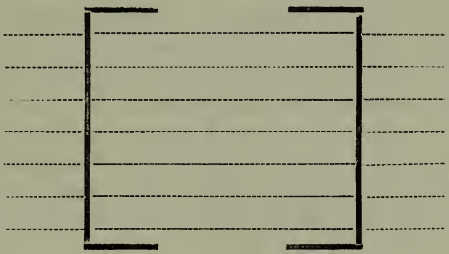
The papers, magazines, or whatever it is desired to bind together, are first prepared by removing covers, superfluous pages of advertisements, etc., and then placed in proper order on one another, with the backs made even against a board or other straight surface.

A supply of tinned iron or copper wire, about No. 18, is required. This comes in quarter-pound rolls, and costs about fifteen cents. This is stretched to straighten it and remove kinks, and then cut into pieces about an inch longer than the thickness of the volume to be bound. The cutting can be done with pliers, or a stout pair of scissors.

Next take these pieces, and either in a vise, or an anvil, or on any square bar of iron, or the edge of a hammer, turn up at right angles to the rest, about three-eighths of an inch at one end; hammering out the portion thus turned up until it is flat.

Then with a good sharp awl (a straight shoemaker's or saddler's awl, about two and one-half inches long, is preferable, fastened, if possible, in a handle such as shoemakers use for pegging), make holes as near the back edge of the pile to be bound as you can without running the risk of their tearing out when bound. The number of holes will depend of course on the size of the book. It is not well to employ less than four of the fasteners nor to have them more than three inches apart. An even number is preferable, four or six. A clamp or wood-screw may be used to hold the books while making the holes, if desired.

The wire fasteners can now be pushed through these holes, from the top, turning the flat hammered portion parallel to the length of the book, the alternate ones pointing in the same direction. This will leave about an inch of the straight part of the fasteners projecting on the other side of the volume. Cut this off so as to leave about three-eighths of an inch, and turn this down by hammering, in the same direction as the short piece on the other side.



A coat of glue or thick mucilage is applied to the back, and a strip of muslin or brown paper is pasted on and lapped over a quarter of an inch on each side. The final cover can now be pasted on, and the volume is complete. The outside pages of the periodical usually make a good cover, and an odd one can be cut up, and the title put on the back. If the cover paper is too thin a sheet of manilla paper can be first used, and the cover paper pasted on that.

This method is not applicable when a volume is to be in daily use; it is much better in that case to have it regularly bound. But for things that are only occasionally referred to it answers every purpose. The book will not open out perfectly flat, like a bound one, but that is of little moment. The books can afterwards be bound in the regular way, just the same as if they had been kept in any of the patent "files" or "binders." The method is simple and inexpensive, and takes but a short time to do.

Jos. S. Rich.

New York.

A COPYING AND ENLARGING CLOSET.

The following description of a copying and enlarging closet will doubtless be found valuable by the professional or amateur who can not afford to purchase a copying camera. Any size of work—from the smallest possible plate to life-size or larger—can be readily made with it. Its advantages over the ordinary dark closet are the great facility with which its position may be shifted, and also the fact that negatives can be as easily made in it as in a copying camera; while, for making enlargements on bromide paper, it can not be excelled.

The material used is brown duck canvas—any similar material, impervious to light will answer equally well—this is sewn together into a piece six and a-half feet wide, which is to be the height of the closet, and nineteen feet long, and one edge of this piece is then stitched around the edge of another piece measuring 6 by 3 feet, thus leaving one foot lap, which should come on one of the short sides.

When this is done we have a canvas box measuring 6 by 3 by 6½ feet, open at one end—the bottom—and with a flap to serve as doorway. Fasten hooks to the four top corners, and suspend the closet by these from two cords tightly stretched across the operating room at a height of six and a-half feet from the floor and three feet apart.

In the front end of the closet a circular hole is cut out of a size to fit snugly over the hood of the lens. It would be better, however, to cut an aperture, say 8 by 10 inches in size, in the place of the circular hole, and permanently fasten a frame thereto capable of receiving kits from 8 by 10 down to the smallest size required. This would then serve for the reception of negatives to be enlarged; and by having various 8 by 10 pieces of paste-board with circular holes the size of the hoods of the different lenses to be used, nothing more will be desired.

In one side of the closet should be an 8 by 10 aperture with a pane of non-actinic glass, or other material let in. When the processes of copying or enlarging are in operation, the pane can be covered with a flap of black calico during the exposure.

It will probably be found necessary to sew or fasten one or two more hooks between the corners of each side, to hook over the cords, so as to prevent the central parts of the closet from sagging. Also, should the ceiling of the closet be inclined to sag in the center, insert a lath crosswise of the closet and fasten each end to one of the central hooks by a stout cord or wire.

Inside the closet should be a table about eighteen inches wide, four feet long, and of a height to suit the tastes of the operator. On the table is a board six inches wide, one and one-half inches thick, and about eight feet long, one end of which extends through a slit in the front end of the closet. The board should be perfectly straight, with parallel edges, and fastened securely to the table, either permanently or by some adjustable device. Upon this board are the upright frames carrying the lens, the sensitive surface, and the object to be copied—the latter, of course, being outside the closet on the projecting end of the board. These upright frames are of the simplest nature, consisting merely of inch board two feet high and six inches wide, fastened to blocks running square and true on the edges of the horizontal board. The upright board must be exactly perpendicular to the horizontal one. Methods of fastening the object to be copied, and the lens to their respective frames will be obvious. The upright board carrying the sensitive surface should have fastened to it a removable board 2 by 2½ feet, and one inch thick, upon which a shifting frame is placed to receive kits and film carriers of ordinary sizes. For extra large work a board 3 by 4 feet with a shifting frame of corresponding size may be kept on hand.

All of the surfaces inside the closet should be stained a non-actinic hue; and it would be well to have the object to be copied placed on a non-actinic surface. It is also advisable to make card-board diaphragms with an aperture not smaller than one-half the diameter of the lens, and to place one before and one behind the glasses to cut off marginal rays. By following these precautions a brilliant negative will invariably be secured, though in some instances the card-board diaphragms should be removed.

In case of light getting under the bottom of closet, take a few yards of black calico and pin to the lower part of the closet, so that the folds will lie close to the floor.

Any elaboration of the advantages of this closet is unnecessary. By having hooks fastened at various points on the walls of the room, the position of the closet can be varied at will by simply adjusting the cords. Any person who is slightly acquainted with the necessities of the copyist will at once comprehend its construction and use.

W. H. Gardner.

BRISTOLVILLE, O.

OBSERVATIONS.

The introduction of the dry-plate is working a great change in the class of instruments (lenses) used in a great many of the smaller, and in some of the larger and more important studios. The portrait combination is unfortunately, I think, being replaced by the double combination view lens of the rapid rectilinear type.

All these lenses are characterized by great depth of focus, extreme sharpness of definition when stopped down, and by slow action. The rapidity of dry-plates has made them available for portrait work, while their comparative cheapness, their extreme depth of focus, and wide, flat field, has made them popular.

The most marked effect of the use of these lenses in portraiture is the extreme hard sharpness of the work; heads look as if cut out of stone or wood, and there is almost a complete lack of plastic effect and natural softness. These defects can be partially remedied by using no stops, or only the larger ones, but unfortunately I fear that the most of those who use these lenses, prefer them for the very qualities which I find objectionable.

I think I have put myself on record as a lover of thin negatives, and I would again express a preference for the quality of negative that most operators in these days would call thin, and that certainly would require a strong silver solution to sensitize the paper for printing them.

Such negatives when properly made or developed, more nearly reproduce the niceties of artistic illumination than any others. It is true that they require more labor from the retoucher, but that labor when skillfully bestowed is well repaid in the proofs.

I contend that an ample exposure and slow development with a weak developer, retarded if necessary, will put more rotundity and a better gradation of detail and intensity into an image on a dry-plate than any other method of treatment, and then, consider the convenience of being able to print a dozen easily from the same negative on any fine day.

This brings me to the subject of printing, and the preparation or sensitizing of the paper.

I have some familiarity with silvering solutions, and my preference is certainly for a plain solution kept neutral by the addition of a few grains of bicarbonate of soda from time to time—this is the simplest form and the most reliable. Keep a sediment of carbonate of silver in the bottom of the solution, and it will always be in working order; don't filter it, but after pouring it into the dish or tray for silvering, skim the surface with a strip of tissue paper. Keep the solution from thirty to fifty grains to the ounce in hot weather, and from fifty to seventy-five in cold, as the paper may require; fume either wet or dry, but dry thoroughly before using. If paper is taken from the silvering bath and placed between blotters to dry, don't use any pressure to force contact; it would injure some papers, and produce a mottled surface. Use a strong silvering solution for thin negatives, and print through two thicknesses of fine tissue paper. If the silvering solution should change color it is a sure sign that it is becoming acid, the remedy is to put in a little more bicarbonate of soda and set it in the sun for a time.

I am a strong advocate for simplicity of formulæ. The best work I have ever seen was produced by the skillful use of simple formulæ. We have reached this point in formulæ for silvering solution, for toning solution, and we are rapidly coming to the utmost simplicity in developing solutions, the tendency is all in that direction; what tells is the skillful use of them. The photographers who take exhibition prizes, produce their exhibits by the aid of skillful hands guided by acute and trained intelligence. The same lenses, the same apparatus, the same paper, mounts, and other stock that they use, are obtainable by every one.

I have observed that many photographers, and able ones, too, since the introduction of the dry-plate have adopted the custom of greatly reducing the light when posing, and illuminating their sitters, with the effect only, as it seems to me, of prolonging the exposure and securing negatives having less brilliancy and sparkle, or crispness, and undoubtedly with less rotundity and with fewer gradations of details from high light to shadow. Negatives made with such lightings have their peculiar character, it is true. I very much doubt if prints from such negatives, however beautifully executed, would be accorded a place in an exhibit of fine art photographs, which should be selected by connoisseurs. I am equally confident that our ablest artists do not practice this method of illumination. Light is the photographic artist's pencil; a blunt pencil will not produce a fine line; it is better to err in the other direction.

E. M. Estabrooke.

NEW YORK.

ABNORMAL CHLORIDE OF SILVER.

When it happens nowadays, that somebody thinks he has invented a new thing, or has made new observations in the wide field of photography, he should, before making them public, consult carefully all journals and books on photography written and printed during the last thirty years, to assure himself, that Akiba's verdict, "as old as the hills," may not be pronounced against him. To do so is, however, a labor worthy of Hercules. I have not undertaken to do anything of the sort, and can not absolutely assure my readers, what I am about to tell them has not been observed by some one at some time or other during the last thirty years, that is to say, during the period that photographic chemistry has had an existence. The great authorities in chemistry have paid but little attention to photo-chemical phenomena, as we learn by reading their books, and if any of them should now find occasion to correct my statements, I am perfectly willing to accept them with all possible meekness and modesty, as long as such corrections are based upon reason and upon facts.

The nature and properties of chloride of silver are perfectly well known to all my readers, especially this, that when exposed to light, it will darken, will assume a gray color. It might well be presumed, that when mixed with but extremely small quantities, mere traces, of some foreign body, this property of silver chloride would not be totally destroyed. Still, such is the case in a variety of instances. To compare chloride with iodide of silver, its twin brother, as it were, we find it also well known to every photographer that the iodide formed in the presence of an excess of metallic iodide, is but little or not at all sensitive to light, while, when precipitated with an excess of silver nitrate, the iodide of silver formed will turn brown in daylight visibly and rapidly. This can not occur with chloride of silver, although when it is mixed with an excess of nitrate, as we encounter it in our daily practice with sensitized printing paper, it colors in light more rapidly, and with much greater intensity than paper differently prepared.

On the contrary, a chloride of silver, totally insensitive to light, is precipitated when a few minims of nitrate of silver are added to a solution of platinic chloride. The result, of a dirty, yellowish color, will never change in light. The precipitate contains platinum, in a combination not yet distinctly described, which, however, can be removed from the precipitated mass by nitro-muriatic acid, when light sensitiveness will be restored to the remaining silver chloride in a degree much below that of normally prepared chloride of silver. The yellowish precipitate is soluble in hyposulphite of soda, but the solution deposits, after a few hours, a brownish-black precipitate, probably sulphide of platinum. Ammonia dissolves from it the chloride of silver only, a yellow residue, platino-ammonium chloride remaining.

Similar to the platinum salt are the reactions of mercuric chloride towards silver nitrate. With an excess of the mercury haloid a white precipitate not affected by light will accrue.*

A trace of nitrate of silver or of ammonia gives sensitiveness to this mercuric combination, but when treated with hot nitric acid sensitiveness is again destroyed, leaving a yellowish-white residue, which resolves itself finally into hydrochloric acid and mercurous chloride.

The chlorides of copper, cobalt and others of the heavier metals, form normal chlorides with nitrate of silver. Chloride of gold produces chloride of silver, with an equivalent amount of gold admixed, but, differing from the chloride generated from platinum haloid, is light-sensitive, while the silver chloride can be dissolved from it by hyposulphite of soda.

A remarkable fact is the behavior of stannous chloride, a salt possessing the property of dislodging precious metals from their respective solutions. When silver nitrate is mixed with its solutions, chloride of silver and finely divided silver in metallic form precipitates. Nevertheless, Spiller has published in the *Photographic News*, of November 18th, 1859, a method of printing on paper based upon the actions of stannous chloride.

Repeating the experiment, it will be found that paper prepared with stannous chloride turns black immediately when brought in contact with silver. May it be possible Mr. Spiller meant the very rare and difficult-to-prepare stannic chloride? Attempts to develop bromide of silver gelatine plates with stannous chlorides have given no satisfactory results.

The precipitate generated by stannous chloride and nitrate of silver contains presumably the photo-chloride of Mr. Carey Lea, whose complete researches are not accessible at this writing. His photo-chloride may possibly be obtainable by treating the precipitate with heated, dilute nitric acid.

Dr. Julius Schnauss.

JENA.

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*My observations on the chemical reactions of the mercury salts have been fully described in *Pharmac. Archiv.*, No. 5, Vol. VI., new series.—Dr. J. S.

DRYING NEGATIVES QUICKLY.

WITHOUT doubt, the proper way to dry a negative is spontaneously—after a thorough washing; but occasionally, for journalistic or other urgent purpose, the washing may be slighted temporarily, and the drying accomplished as rapidly as possible thereafter. By the method I shall mention—one I have used for several years, as occasion demanded—it is possible to have the negative ready for printing, "bone dry," in five minutes after fixing and rinsing.

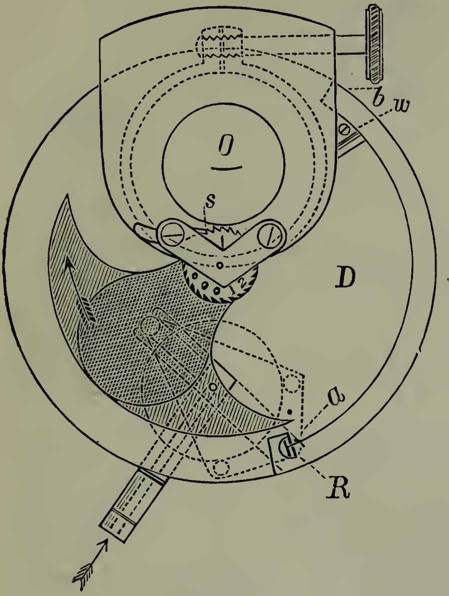
We will suppose the negative fixed and washed in several changes of water. Take a piece of old linen towel—not so old as to part freely with lint, but sufficiently so to be quite soft and absorbent—and place it upon the upturned, film side, of the negative; lightly pass the hand over it several times, and remove. Should any spots of moisture remain, "dab" them with a corner of the towel until an evenly-wetted surface is presented. If any lint adhere, do not try to remove it. A soft brush, after the negative is dry, will save time, patience, and very possibly a valuable negative. Dry the reverse side to insure against cracking, and then take to some source of heat—gas-jet, register, or stove, the top of kitchen stove or range being as good as either—and present the film side to the heat, keeping a distance of from four to six inches removed, the negative in constant and rapid motion, sidewise, frequently withdrawing to examine progress. One caution: On no account allow the glass side of the negative to be next the heat. In a few minutes the negative will be thoroughly dry and ready for use. The writer completed one in three minutes this morning, with such pleasing result that it occurred to him possibly some reader of the ANNUAL might care to adopt his method.

F. A. Jackson.

NEW HAVEN.

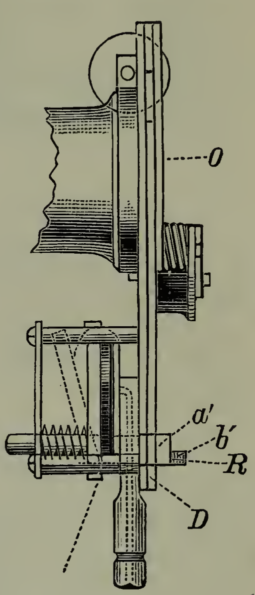
A SIMPLE TIME AND INSTANTANEOUS SHUTTER.

Fig. 1 shows a front, Fig. 2 a side elevation of the same while Figs. 3, 4, 5, 6 and 7 are details in the operation of the release pin relatively to the revolving disc *D*.



Compressed air from rubber bulb.

FIG. 1.



Diaphragm.

FIG. 2.

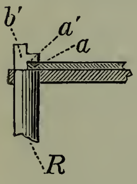


FIG. 3.

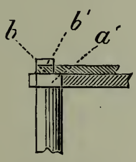


FIG. 4.

Time exposure.

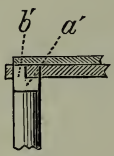


FIG. 5.

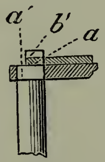


FIG. 6.

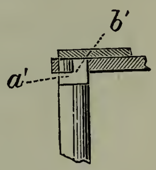
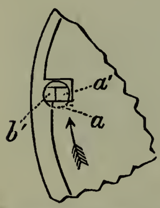
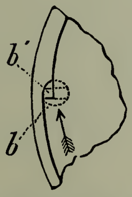
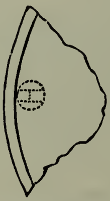


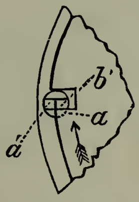
FIG. 7.

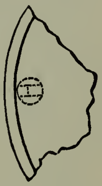
Instantaneous exposure.











Figs. 8 and 9 show more closely the pneumatic arrangement. The rubber hose and compressing bulb have been left off, as they do not differ from those generally used in that connection.

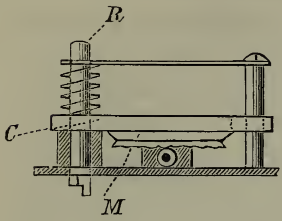
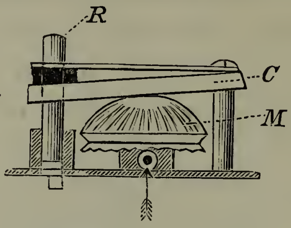


FIG. 8.



Air pressure from rubber bulb.

FIG. 9.

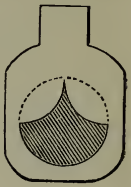


FIG. 10.

A watch spring contained in center of disc, the tension of which can be altered at will by means of pawl and ratchet wheel, furnishes the power to revolve the disc in front of lens opening O.

The release pin R has two shoulders, a' and b', which stop the disc respectively at a and b. One pressure of the rubber bulb, whether strong or weak, short or long, can not lift the pin higher than the height of one shoulder. If, therefore, the pin is set at the start in the position shown in Fig. 3, one pressure will disengage a from a', the disc will turn until b strikes b', and stops (see Fig. 4). A second pressure of the bulb is now required to raise shoulder b' sufficiently to let b pass and the disc comes to its third and last position (see Fig. 5), and the exposure is completed.

If an instantaneous picture is wished for, the stop R is turned 180 deg., so that the shoulder b' stops a (Fig. 6). One pressure of the bulb is now sufficient to completely liberate the disc, which will revolve into the third position without stopping in the second (see Fig. 7). Wedging stop w prevents any recoil of disc. The shaded sector in Fig. 2 represents an opening which will give uniform exposure to the whole plate.

It is very often wished to expose the higher lights, as sky for instance, less than the darker foreground. This could be obtained by using a disc, the opening of which is similar to the double shaded portion in same figure. I got, however, the same result by using a stationary diaphragm of shape Fig. 10.

The pneumatic arrangement acts as follows: C is a clutch with a hole through which release pin R will freely pass when its axis is held at right angles to the plane of the former. A spiral spring tends to push the clutch against the diaphragm. The latter, in my case an elastic membrane of sheet rubber, will cause the clutch to raise on one side more than on the other. The pin once firmly gripped will by further expansion of the membrane be raised as far as the spring will allow, and then the retracting power of the latter being applied in the direction of the axis, will cause the clutch to return to its former position ready for another lift. It is obvious that in its place a brass cylinder with piston or a ratchet motion might be employed. The one described seems, however, to be the simplest.

If this communication should prove of utility to any of the readers of the ANNUAL, the purpose of the writer has been fulfilled.

Hermann Lemp

HARTFORD, CONN.

COLLODION EMULSION.

THE gelatine dry plate has of late years superseded the collodion bath and emulsion processes to such an extent that these older methods, notwithstanding the undeniable fact that some of the results obtained with them have never been equalled, far less excelled, by any modern process, are altogether too much ignored, at least by the photographer of the new school.

It may not be amiss then to call the attention of the readers of this ANNUAL to some of the most practical applications of collodion emulsion to laboratory work, which may prove useful and interesting. Without entering into the details of its preparation let us assume that we have obtained a bottle of emulsion from our photographic stock-house and proceed at once to see what we can do with it. Perhaps you have a valuable negative, which you would like to duplicate. If working in the ordinary way, you would have to make a transparency first, and from this, on a second plate, the desired negative, but with collodion emulsion we can simplify matters greatly and make the negative, either by contact or in the camera, direct and in one operation. Clean and albumenize your glass as for collodion bath plates; when dry, coat with emulsion, which should be well shaken about half an hour before use, then wash well under the tap, or soak in a tray, until all greasiness has disappeared and the water flows evenly over the surface. If intended for the camera, the plate is ready for exposure after a short draining; if for contact printing it must, of course, be dried. No preservative is necessary. To avoid delay we will expose the plate in the camera while wet and give it twenty times the exposure required for a rapid gelatine plate. With a stop $\frac{f}{64}$ it may require ten minutes, while, if we had dried it first, five minutes would be sufficient, and in contact with a normal negative five seconds' exposure to diffused light would probably be ample time. Prepare your developer as follows. The formula given in the direction accompanying the emulsion may be good, but this one, I think, is better:

Carbonate of soda	3 ounces.
Bromide of ammonium	48 grains.
Honey	1 teaspoonful.
Water	24 ounces.

To each fluid ounce add two grains of dry pyro immediately before use. Mix fresh developer for every plate, as it decomposes rapidly. Hold the plate between thumb and forefinger by the corner left bare in coating and pour the developer on and off from a cup, as access of air favors reduction. The image will appear rapidly and development should be completed in about two minutes. If progressing too quickly, restrain with a few drops of bromide of potassium, sol. 1 to 8; if flat, add more pyro; if the shadows are hanging back, throw off the developer and apply a fresh portion of the soda solution with only a trace of pyro, and when all details are well brought out, wash thoroughly under the tap. We now have a perfect positive on the surface of, and in absolute contact with, a so far unaltered film of silver bromide, hence it will be seen that, if this plate be now exposed to light, the sensitive bromide of silver will be affected in inverse proportion to the opacity of the superimposed image—in short, will be converted into a latent negative. To accomplish this place the plate, face up, on any suitable, dark support that will effectively prevent any light from entering from the back and, opening your dark-room door or window, expose to daylight for from two to five seconds, according to the intensity of the overlying positive. Next pour over its surface a small quantity of nitric acid (to avoid the obnoxious fumes I use a dipping bath with glass or porcelain dipper), when the image, consisting of metallic silver, will speedily disappear, leaving behind a perfect, creamy-looking negative, which must now be developed once more in the same manner as described above. Fixing may be done in hypo, but on account of the greater permanency of the plate with but little washing I prefer a twenty grain solution of potassium cyanide. In the same way may lantern slides or window transparencies be made direct from paintings, engravings, objects of art, and in fact any subject admitting of a protracted exposure, and from these enlarged negatives of any size are easily obtainable by proceeding exactly as for enlarging on bromide paper, thus avoiding the necessity of a large camera. Aside from being simple and expeditious this process had the advantage of giving greater sharpness to duplicate negatives, some of which is inevitably lost in every successive stage of copying, and as to the color of the deposit, which varies according to length of exposure given from a rich brown to a pure engraving black, it is hardly excelled by any other method of my acquaintance, save, perhaps, the albumen process.

Commercial emulsions are sometimes inclined to fogging. If an increase of restrainer in the developer should prove ineffective, the evil is probably due to free silver nitrate. To ascertain this, pour a small quantity of the emulsion on a strip of glass, wash under the tap, and apply a weak solution of sulphate of iron or ordinary wet-plate developer. If, under its action, the silver bromide darkens, it may be accepted that free silver is the cause of the trouble, but this defect being easily curable, it is of but little consequence. Prepare a 20-grain solution of chloride of ammonium or, preferably, chloride of cobalt, add a few drops to the emulsion, shake well, and test again. One dose may have perfected a cure; if not, add more in very small quantities until working clear. After fixing and thorough washing, soak the plate for half an hour in water acidulated with acetic acid, in order to remove the last traces of pyro, which, more than much abused hypo, is the cause of so many yellow negatives and discolored transparencies.

C. E. von Sothen.

WHITESTONE, L. I.

DURABLE SENSITIZED ALBUMEN PAPER.

I HAVE worked for the last twelve years exclusively with durable silvered albumen paper, which I prepare in the following manner:

I weigh out any desired quantity in the following proportion:

Nitrate of silver	100 grammes.
Citric acid	100 grammes.
Alcohol	100 c.c.m.
Water	1000–1200 c.c.m.

I dissolve first the silver salt in 250 c.c.m. of water, and the citric acid in the same quantity of water separately. The two solutions are then poured into the stock bottle. With the rest of the water the bottle in which the silver has been dissolved is rinsed, and after all has been poured together, the alcohol added.

The paper is silvered in large trays, constructed as follows: In a wooden frame (oak) 10 c.m. high and 3 c.m. thick a groove is cut about 2 c.m. from the lower edge, running on all four sides, and into the groove a piece of thick plate glass embedded with cement, one side of the frame remaining open. When the plate of 48 by 68 c.m. has been properly inserted, the fourth side of the frame is attached to it, closely pressed together, and the cement allowed to dry. After about two weeks wood and cement are covered four or five times with a thin asphaltum varnish and dried perfectly. The tray resists then all possible action of the silver solution. Any traces of organic matter still present will be totally destroyed by allowing a solution of permanganate of potash (1.1000) to stand in it for a day or longer About 4 or 5 c.m. from the one end of the tray and on the long sides of it, cuts are made, and a glass tube of ½ c.m. thickness laid transversly over it.

The paper is allowed to float on the bath for two minutes, lifted up, drawn over the glass tube and laid with the silvered side down upon a pile of blotting paper. When silvering about fifty sheets at a time the two or three upper strata of blotters must be frequently renewed. At last a clean and stiff cardboard is laid on top and the whole pile rubbed down with the hand, so that when the silvered sheets are separated they do not appear glossy from adhering liquid. In this state the silvered papers, two at a time, are hung up, back to back, and dried, of course protected from light.

After four sheets have been silvered the time of floating on the solution is extended to two and a half minutes, and after the seventh sheet to three minutes.

The tenth sheet having been taken up, the solution requires to be strengthened. For that purpose I keep two solutions:

I.—	Nitrate of silver	45 grammes.
	Distilled water	70 c.c.m,
II.—	Citric acid	30 grammes.
	Distilled water	100 c.c.m.

Of these solutions are added, first 30 c.c.m. of I, and then 40 c.c.m. of II, finally 20 c.c.m. of alcohol. These quantities used for the rectification of the bath, as well as the original solutions have proved by a practice of many years to give satisfactory results, and to keep the bath practically in the correct condition and of uniform strength.

When the bath, after having been used, is returned to the stock bottle, it will after a short time assume a slight yellow color, about that of a light Rhine wine. No harm results from that to paper subsequently silvered. Gradually a deposit of nitrate of silver will form on the bottom of the bottle, from which the solution is separated by filtration. The precipitate removed from the bottle by scraping with a glass rod and washing may be thrown in the silver waste.

Immediately after drying I roll the sheets upon a wooden stick, where they remain for one day, and are then laid flat in a portfolio.

Paper prepared in this manner keeps for a comparatively long time even in summer, and I have used it when two or three months old with such brilliant results that between it and freshly silvered paper no difference could be perceived.

I tone this paper in the usual manner, and after the prints have passed through three wash waters. The so-called durable toning baths must not, however, be employed. The citric acid coming in contact with the gold solution turns it speedily black, owing to a reduction of gold.

I prefer generally the borax bath, and use for every sheet of silvered paper:

Gold solution (1.50)	2 c.c.m.
Borax solution (15.1000)	100 c.c.m.
Water	100 c.c.m.

Fixing and washing is done in the ordinary manner.

Karl Schwier.

WEIMAR.

HIGH OR LOW ART.

In the first place can there be truly any such thing as high or low art? Must not a production come under the designation of either art or no art? Yet the terms high and low art are commonly used and presumably with a definite meaning; and as generally understood, we must accept and use them in any discussion or consideration of this subject. In a recent lecture in this city the speaker defined high art as the embodiment of an artist's imagination, the interpretation of his ideal; as creation, and in no sense imitation, wherein it differed essentially from low art, which, he considered was imitation.

This imitation of nature and natural objects, however, might be executed so cleverly by the artist as to become great, but never could be what he understood by the term high art.

Some would define high art as the embodiment of a great religious idea, and would call genre compositions low art, but according to our first definition a genre may be high art if it be the representation on canvas of artists' ideal conception. In a word then it is better to assume as understood in our present consideration, high art to be the subjective and low art the objective representation in paintings.

It then becomes evident at once under which designation the product of the camera must be placed; for the photograph in no sense is a creation of the artist. While a photographer may have an idea to interpret, and be truly a high artist in his conceptions, the agencies which he uses are not entirely under his command, and, like a painter who has small skill in mechanical execution, he is fettered in his attempts to represent his idea, and as a photographer can only reproduce what is reflected upon his ground glass. But the photograph is certainly very high low art, and as such is infinitely superior to the very best products of that school of painters—now so popular—who attempt to transcribe nature, as they see it, conscientiously on their canvases, but who are attempting a hopeless task. The artist's hand, unaided, can never reproduce in all its details, and delicate shades of color the natural scenes and objects which they attempt. While the camera, so far as form is concerned, and the varying degrees of light and shade, can give an absolutely correct copy of the landscape or figure before it, and only awaits the discovery of how to retain the natural color shades to become, in its way, the perfect artist which the naturalistic painter is vainly striving to become.

W. I. Lincoln Adams.

New York City.

THEATRE PHOTOGRAPHY BY ELECTRIC LIGHT.

I have had occasion to undertake the photographing of the various scenes and situations in some of the most successful plays recently seen in New York. The results in each effort have been more satisfactory than in the preceding ones, and good effects are now obtained with reasonable certainty. The operation is expensive, costing usually one to two hundred dollars, but from the fact that the work is being more and more called for by managers, it is evident that they consider the game to be worth the candle, or, to speak correctly, the electric light.

The proceeding is an interesting one. The company is "called" for a certain day and hour, which I am sorry to say is not unusually Sunday. Some hours before the time stated, the theatere is given over into the hands of the electric light men, who proceed to fringe the stage, wings and borders with a series of arc electric lights, arranging them in such a way that their full light falls on the stage, but screening them so that their rays can not enter the lenses of the photographic cameras which are placed at the back of the auditorium. About an hour before the call the camera men put in an appearance and erect a platform in the auditorium the right distance from the stage and a sufficient height above it to give a pleasing picture. The cameras I usually employ are three, 10 by 8, 8 by 5, and 7 by 5; the lenses, a 15 "Euroscope," a 13 "Beck," and a 9 "Steinheil group antiplanat." For plates I have carefully tried both glass and paper, and though the latter has some distinct advantages such as absence of halation, and the power of rapid exposition by means of the roll-holder, I give the palm to glass plates as yielding the best results. I have tried orthochromatic plates but I have found they do not give such satisfactory results as the ordinary plates and they are not so sensitive.

For the time of exposure, with from 30 to 40 arc lights having a strong current, plates having a sensitometer number of about 30, and stop of $\frac{f}{16}$, I find with the Euryscope 10 to 15 seconds is not too much, with the Beck 9 to 12 seconds, and with the Steinheil 3 to 5 seconds. But much depends in this respect on the coloring of the scenery and of the *costumes*. The black evening dress of the man in the modern society play is a pretty hard thing to get anything out of, whilst the tights and silks of the burlesque actress are always round and well modeled.

The electric lights are used with ground glass globes, and such disposition is made of them as to give the most artistic lighting. I like to have a preponderance—but not too great a preponderance—of light coming from one direction, somewhat high and in front, and from the left or right as may be desired.

When the hour at which the "call" has been made arrives, the members of the company begin to straggle in, usually in a state of overflowing profanity at being defrauded of their sleep. The question is at once asked are they to "make up"—that is, paint and powder, and so forth, as at night. Though it is not necessary as regards the color, I have concluded to say yes, because otherwise they will not put on all the necessary wrinkles and "character" lines.

When all the company has arrived it is usually discovered that the leading man is conspicuous by his absence. On enquiry, it appears that he is very sick, but a carriage is sent for him. Of course, the real reason he is not there is because he has forgotton all about it, or has been to a supper the night before. I can tell you that a "leading man" is "a little tin god on wheels." At last all is ready, and woe betide the photographers if they are not ready, too, on the instant.

The scene is beautiful indeed. The whole house is darkness, not a single light is visible, but the stage is a flood of illumination, bringing out the beauty of the scenery, the costumes, and the human form, and making a picture not easily forgotten. It is the business of the stage manager to indicate to the actors the situation, or tableau, or picture, to the photographed. This seems to be best obtained by reciting the "lines" leading up to it, and at the required point "holding" the pose while the exposure is made. This can not always be absolutely done, for the photographer will see many points that must be changed. But it is not difficult to get back to the desired pose when the company once understands it. Then comes the photographer's final word, "Now quite still, please. No, that lady must *not* talk. Now *please*, quite still." Then the exposures, all made simultaneously, by signal. Then "Thank you, that's all," or very often, "I'm afraid we must take that again, there was so much movement, and if the ladies and gentlemen will realize that we must continue to take them over and over again if they move, we shall get through quicker." If all is right, the next situation, or the next scene, is proceeded with. It appears to be invariable with the stage manager to suppose that directly the cap is on the lens, the photographer should be ready to take another picture. Argument on this point is useless.

A small audience always gathers in the house. Friends of the company, reporters, etc. They are always in the way and the photographer has to be all the time desiring them to go to one side. The actors and actresses will sometimes come into the house and watch the proceedings when not "on." It is curious how almost universally they express astonishment at the beauty of the scenery and setting of the play. Their observation has been so entirely confined to their own parts *on the stage*, that they are completely ignorant of everything else. The criticisms of the actresses in the house, regarding their sisters on the stage, are often quite amusing. There are amusing incidents, too, that happen. Sometimes comes a messenger to the manager sitting by me: "Miss So and So won't dress; says she does not give or get a cent for this business; doesn't care for the manager or any one else," etc., etc., etc. I leave out all the adjectives. The manager is evidently frightened, but makes up his mind he has to face the music and goes to do it. I am bound to say that in due course Miss So and So does appear, dressed, or, in this case, dare I say, undressed, for her part.

There are three very essential points in successful work of this kind. Good lighting, short exposures, and a well managed company. With the latter almost anything can be done. It was a pleasure to make the negatives of Mr. Augustin Daly's "Taming of the Shrew." Under Mr. Daly's firm hand and kind voice, and with his kinder manner, every member of his company did earnestly and intelligently what was desired of them; and the photographer's lot was a happy and an easy one.

With Robson and Crane in "The Henrietta," there was no real difficulty, but the irrepressible tendency to fun, almost upset the photographic conditions. "You mustn't smoke, Mr. Crane," says the voice of the photograper from the darkness. "But I do it in the play." "Well, you can't do it now." Then the look of surprise and half anger at being told what to do and the final look of resignation with which the cigar was laid down. It was worth seeing.

"Keep your eye-glass up, please, Mr. Robson." "I cawn't do it, my dear fellah; I don't know how."

But when the many necessary elements of the burlesque company have to be wrestled with it is a different matter. The only chance then is in short exposures, and having a thorough understanding that the work has got to be done and done satisfactorily before the company is released.

Altogether, this electric light business is an interesting revelation of one of the phases of photography of to-day in contrast with the photography of ten years ago. The negatives are made by artificial light, in a mere fraction of time, on gelatine plates. From these negatives permanent prints of a high order of excellence are made by the thousand, mechanically, on power presses, in any ink or pigment that may be chosen. If this is not progress, what is?

Ernest Edwards.

NEW YORK.

PHOTOGRAPHY IN THE NAVY.

IN consequence of the rapid strides made in ordnance and ship construction at the present time, and of the complex nature of the modern man-of-war, with its high-powered guns, its numerous engines, its torpedoes, and its electric lights, the navy officer of to-day finds himself called upon to include in his scheme of study so many branches of knowledge, that there is no time left for "fancy work" of any description. And in consequence of the general acceptance of this opinion, there are not wanting officers who look with disfavor upon the addition of a photographic outfit to the equipment of a man-of-war. They regard photography as an amusement, a pastime, and nothing more.

This is a manifest error. Photography is a most valuable adjunct, and the facility with which it may be applied, at the present time, in consequence of the perfection of the dry-plate system, reduces to a minimum the objections which were formerly raised against it. A dark-room, specially fitted as such, is not now an absolute necessity, although, of course, it is of great convenience. Bad odors, stained fingers and clothing, and inflammable materials are no longer indispensable to the practice of the art, nor does it absorb so much valuable time as formerly.

The charts and sailing directions used by ships of the navy, and of the merchant marine as well, are increased in value by the addition of views of coast and headlands, harbor-marks, light-houses, beacons, and other aids to navigation. For these views, in former days, the navigator was entirely dependent upon those voyagers who were skilled in sketching, and in consequence, the number of such illustrations was small, and particularly so where they were most needed, in parts of the world little frequented. The camera has changed all this. Its sensitive plate and drop-shutter have put it in the power of every navigator to add to the number of views, and the results are, of course, of far greater accuracy than the average of sketches formerly supplied.

In the hands of the hydrographic surveyor the camera is a powerful assistant, supplementing the theodolite and level, and replacing the sketch-book with great saving of time, and improvement of detail.

In reports of progress abroad, the camera is invaluable. Turn, for instance, to the Panama canal. It is the custom every year for an officer of one of the vessels of the North Atlantic Station to examine and report to the navy department the condition of the canal, its progress since the preceding report, and its prospects for the future. Photographs taken at the same points from year to year, give the greater part of the information more eloquently than many pages of description could do.

Views taken after the burning of Aspinwall gave our government a better idea of the ruin caused by the rebel Prestan, than was possible by mere description, and photographs taken at the time our forces landed there, a few days later, were proofs of the promptness of action taken by the Navy Department to carry out the terms of the treaty with New Granada. Photographs of the armored cars which were then prepared by officers and men from our fleet, placed on record the manner of their construction, and other photographs taken along the line of the Panama Railroad, showed how the forces were distributed, how they were quartered, and what was the nature of their surroundings.

Reports of foreign men-of-war and fortifications, when accompanied by photographs, are of much greater value to the government than if they consisted of descriptive matter alone. Photographs taken immediately after a collision may be of value in the subsequent inquiry. Descriptions of invention, and of civil engineering works, are rendered intelligible by the use of the camera, and, in fact, examples of its value to the navy officer might be cited indefinitely.

It is, of course, desirable that the naval amateur photographer should have some knowledge of the manipulation of the plate, from the time it leaves the packing-box until it becomes a finished negative, but, happily, the dry system gives such independence that the amateur may confine himself to the simple exposure of the plates if he so elects, leaving their manipulation to others more skilled than himself in the use of the developer. He will in that way reduce the bulk of his outfit, and in the absence of a dark-room (which is wanting on board nearly all of our vessels-of-war), he will be relieved of much labor and inconvenience. But, on the other hand, he will be crippled in his resources. He will never know whether or not he is giving correct exposures, and the result will not, therefore, be so satisfactory as though he were to complete the negative. Moreover, by developing on the spot, he would in very many cases be able to make a second attempt where the first has resulted in a failure.

I do not favor the addition of a printing outfit to the paraphernalia of the naval amateur. Space is too limited, and there is too much sloppiness in the process of printing, to make it desirable, or even permissible, for him to make use of his seven-feet square stateroom for that purpose. Let him make blue prints (cyanotypes) if he must have a positive, or, in case he is not satisfied with those simple, inexpensive proofs, let him make use of bromide paper, which, in its manipulation, does not differ materially from the plate itself, while its results are all that could be desired.

During the past few years the navy department has supplied several vessels with photographic outfits, notably in the case of the Greeley relief fleet, but amateurs in general on board our ships-of-war are obliged to depend upon their own resources. It is to be hoped that the advantages of photography to the navy will soon be recognized to such an extent that every man-of-war will be equipped with the best of modern photographic appliances.

Saml. W. Very,
Lieut.-Comdr., U. S. N.

NEWPORT, R. I.

FRILLS AND BLISTERS.

IN dry-plate work these defects have been the cause of more anxiety and loss than all other difficulties together, and in albumenized-paper printing the subject of blisters has caused the exhibition of more *quasi* scientific explanations and empirical recipes for cure than any that has ever been discussed in the pages of the *Photographic Times.* I am not very familiar with American brands of plates, but I do know that here, some that in all other respects are of exceedingly high quality can not be developed without constant care to avoid frilling, while others again are so hardy that it is next to impossible to produce a frill by any ordinary mode of working. Such full and sufficient explanations of the theory of frilling have been already offered, that no care need be here taken to discuss it at length. It may be taken for granted that, in the majority of cases at any rate, the cause of frilling is the infiltration into the film, and between it and the glass, of a larger proportion of water than of hypo washed out.

When crystalline substances in solution and plain water are allowed to mutually react through a separating membrane of parchment paper, bladder, or such like substance, the crystalline body passes through to the water, and the water passes through to the solution. In some cases the mutual interchange is about equal, in others a much larger proportion of water takes the place of the crystal. Hypo is one of these substances, and a film of gelatine saturated with a solution of hypo will, unless very tenacious in texture, and well held to the glass, swell out when immersed in water on account of this physical property, which is known as osmose.

A similar explanation may be made with regard to blisters on albumenized paper; but it is generally held that the main factor in their production is the degree to which the film of albumen is adherent to the fibrous surface of the paper. It is easy to undertstand that the albumen should swell in bulk in a manner similar to the expansion in gelatine; but it is less easy to comprehend what causes it to leave the paper so as to permit the formation of a blister, seeing that the action of the silver bath is to coagulate the albumen, that is to say, render it insoluble in water, as much so as if it had been boiled, and in consequence one would think firmly fastened to it. It is a general rule that the greater the gloss of the paper the more ready are blisters to form ; in such instances there is probably a greater body of albumen, and so its osmotic expansion is naturally the greater and the strain to its power of adherence passes the limit of stability.

If these facts are kept in view in practice it is a comparatively simple matter to utilize their teaching so as to provide a cure, or, what is better, an antidote. Firstly, a plate may be left to drain for some ten or twenty minutes after leaving the hypo; so much of the salt will drain away that there is far less material within the film to be replaced by water in its accustomed increased proportion.

Secondly, the hypo solution may be made of such diminished strength that the crystalloid is present in such small proportion that no evil may be produced. A combination of the two methods will generally reduce the danger of frilling to *nil*, unless the plates are a very bad sample in this respect.

So far as to prevention; but cases will arise when a cure is needed—when frilling or blisters have set in, and it is desired so cure them. This is not difficult in most cases, as, fortunately, the mutual exchange of water and alcohol exactly resembles that of water and hypo; hence a film expanded by an excess of water, when immersed in alcohol, must, of necessity, contract as the large quantity of water is replaced by the small quantity of spirit. This, in practice, is what does occur; a film made double its original size by reason of exaggerated frilling, will be rendered of normal proportion in a few minutes' time by submitting it to this very simple ordeal, which in no case can injure it. When a huge blister has occurred in a negative (for a frill at the edge, and a blister in the inner regions of the film are identical in causation), it can be reduced to complete flatness by the same means, if the precaution be taken to first pierce the blister with a needle, so as to permit the expulsion of the water as the film contracts. If this be not done, the strain upon the film will defeat the object in view, and there will be a permanent defect. Any one can try this mode of treatment experimentally, by tearing away a small portion of a frill, and dipping it into a graduate containing alcohol, then, after a while, re-dipping it into water; he will find it alternately contact and expand as often as he chooses to repeat the operation..

My own practice in regard to albumenized paper blisters is, I am afraid, open to the imputation of empiricism, for it does not appear to be founded upon any of the above observations. There is, however, one fact which it may be well here to bring forward, as it offers a possible explanation of the success of the practice forthwith to be described. It is that the osmotic action of a mixture of two substances is not necessarily the mean of their individual powers.

Be this as it may, I have never found a sample of paper which refused to yield to the treatment. Alcohol mixed with the hypo solution in the proportion of from one in fifteen to one in five, according to blister tendency, has prevented blisters whenever tried. All these recommendations are the result of personal practice, and, as such, I trust they may be as successful in the hands of the readers of the ANNUAL as they have been in those of the writer.

J. Watmough Webster, F. C. S.

LONDON, England.

THE "DETECTIVE" FOR ARTISTS.

WE have come to expect enthusiasm in the amateur photographer, and it occasions no surprise to see the sacrifice of holiday hours to his favorite pursuit.

Far into the night his little red lantern throws its rays upon the undeveloped plates which he has snatched time from a busy day to make.

"*Nulla dies sine linea*" becomes the motto, though for *linea* must be substituted some appropriate word indicating photographic "dry-plate." Strange as it may appear, the professional artist was slow to appreciate the advantages offered him for gathering information. The ranks of the amateur photographers were filled with men whose tastes were more or less artistic, generally men fond of nature, as expressed in landscape; travelers desirous of bringing back to friends records of their journeys, or giving shape to the more common and familiar scenes about their homes.

As science perfected the chemical and mechanical qualities of plates, lenses, and cameras, efforts in the field of portraiture and *genre* were more frequently made. One by one, professional artists have purchased outfits and made themselves familiar with the use of the now highly-valued "detective."

The perfection of this form of camera met the real want of the artist. What would remain in place, that he had trained himself to reproduce with sufficient accuracy; but the world is instinct with life and movement, and that sometimes of so complex a character as to make it almost impossible to comprehend in all its variety and to record in its perfection. Now the artist's eyes are supplemented by the "rapid rectilinear," and in the quiet of his studio he can look over and carefully examine hundreds of treasured records of flying birds, racing animals, and humanity surprised in an infinite variety of action and under infinitely varied conditions. How fascinating such records are in their incompleteness none know better than bird, animal, or figure painters. I do not leave out of this list the landscape painter because photography is of no assistance to him, but that we are now thinking of instantaneous work, and the slower processes have served for a half century to inform the landscapist. I sometimes feel that photography has been harmful in its failure to properly translate the colors of nature and that familiarity with photographic translations of scenery has influenced for ill many of the illustrators, not all of whom go to nature for inspiration. The faithful students of "out-of-door" effects will, I think, support this charge of the tendency of photography to falsify contrasts and disturb harmonies.

I am mindful of the fact that the detective can be of invaluable service to the landscapist in his study of compositions, as the plates are not very expensive, and many records of groupings of tree, rock, mountain, and water can be hurriedly made.

Much may be said, and justly, too, of the ugliness and the apparent falsehood shown by pictures taken by the detective. In defense I would urge the taking of many pictures of the same subject under various conditions. This is especially important in the case of animal locomotion. The most acceptable combination should be selected, generally that one in which there is some arrested motion. It is the province of art to select the beautiful whenever possible, and to reject the ugly and at all times to be true, as well as beautiful, seldom to be true at the expense of beauty. We must intelligently compare the scientific accuracy of the camera with the limitations of our vision, and rare judgment is often called into play.

With all its shortcomings nothing can profit an artist more, if he does not permit himself to be enslaved by its records, than the portable little camera called the "Detective."

J. Wells Champney.

NEW YORK.

MEMORANDA FROM MY READING AND PRACTICE.

On Exposure.

The intensity of light is greatest in June, and least in December, greatest at 12 o'clock noon, and least at sunrise and sunset.

From April to September the intensity of the light, or, what amounts to the same thing, the time of exposure, remains about the same between the hours of 10 to 2. From September to April, between 11 and 1 o'clock.

Before and after these hours the time should be increased, moderately in summer, more considerably in winter.

White clouds increase the intensity, gray ones diminish it.

Distant hills will photograph in one-half the time an object in the same light will, ten feet from the camera.

Always time exposures for the shadows. There may be exceptions, but let the high lights take care of themselves.

With south and east winds there will be much heat and haze and but little true light.

Diffused light is often better than direct sunlight, as its brightness is apt to eclipse the true ray.

Never photograph with the sun directly behind you; the result would be excessively flat, all light and no shadow.

On Photographing Various Subjects.

In photographing statuary, use a screen over skylight or windows to reduce excess of illumination.

For oil paintings a good result may often be obtained by wiping them over with a soft damp cloth and photographing immediately. A cloudy day is preferable, and never copy in the rays of sunlight.

In figure posing small eyes should be directed slightly upward. Staring eyes a little downward. Deep-set eyes full view.

Never turn eyes in a contrary direction to that of the head. Generally they should be a shade in advance of the direction of the head.

Hands should, if possible, always have their *edges* to the camera.

In taking landscapes equalize the distance and sky by shading upper part of lens with hand, moving it continually during exposure.

Foliage is best photographed immediately after a shower of rain when the leaves are glistening with moisture.

Atmospheric effects of haze are best produced by a side front light, camera being set in direction of the sun.

A light cloudy day is best for photographing the sea, to avoid a flood of light in its surface, which kills all reflection.

Shadows of buildings, the larger the better, give the best results to make portraits in. They make very luminous pictures and provide an even and steady distribution of light.

A great amount of uninteresting foreground may be avoided or condensed by slightly altering the height of the camera. By lowering it a great deal of the blankness of foregrounds might be avoided.

In marine views have the lighting obliquely from the front, as owing to the large volume of reflected light, the shadows would be well illuminated and the reflections most brilliant.

Never let the horizon line cut a picture into exact halves.

Remember to always stop a clock in taking an interior to avoid blurring of the hands.

For focusing in dark interiors use a ground glass with about a square inch unground in the center. On this section of plain glass any object will show clearly and allow the sharpest possible focus to be obtained.

The Use of Diaphragms.

The larger the stop used the more detail to the shadows will be obtained.

A large stop always gives a bolder picture, a small stop leads to flatness.

Never use smallest stop unless it is positively necessary. Only stop down till definition is clear to edge of plate.

A large stop increases ærial perspective, a small one diminishes it.

Focus always with largest stop and stop down afterwards.

Diaphragms should only be used to get a sharp picture all over the plate.

The largest stop that will effect this is the right one to use. A smaller will give only monotone pictures without any advantage.

Instantaneous Work.

In the spring the actinic property of light is most active and best for instantaneous pictures.

The later the time of day, according to light, larger opening of lens must be used.

The most perfect instantaneous work is produced with short focus lens.

When using a square camera, by placing the eye at any of the four corners and looking along the edge, the object which is seen in that line of vision will, if exposed when it is in line with the corner, be eventually found in the center of the negative.

Development.

The longer the plate remains in the developer the greater it increases in intensity. Intense negatives are hard to print, and plates should be developed only for intensity enough to give all the detail with good printing capacity. This can be done by lessening pyro and working with slow alkali solution. When development seems at a standstill put a few more drops of alkali solution in developer to finish.

If any particular part of plate refuses to fully develop, pour developer into graduate and from graduate on that part repeatedly and breathe upon the part between doing so, till it comes up equally with rest of plate.

When plate is properly exposed a weak developer will bring out the darker parts to perfection without over-developing the high lights.

When contrasts are very strong, reduce the pyro and develop very slowly, or negative will give a chalky print. For subjects wanting in contrast develop quickly.

If contrasts are naturally weak, as sometimes the case in open landscapes, increase the strength of all the ingredients, especially of pyro and bromide.

In developing interiors let plate soak in pyro solution alone for a couple of minutes, and commence real development with weak alkali solution, strengthening it as development proceeds.

Stop development when there is no longer any pure white left on plate and when high lights can be seen at the back. This is not true of all plates, however.

Lights should be transparent, and, roughly speaking, the densest parts should appear almost, if not quite opaque.

The alkali should be weakened a little in summer and strengthened in winter. Bromide should be added in summer and decreased in winter.

If in using a strong developer a negative starts all over almost immediately, extreme softness may be obtained by removing the plate to a pan of clear water. The action of developing will continue and can easily be controlled.

Always use freshly mixed solutions for drop-shutter work.

For instantaneous exposures treat plates with weak alkali bath first, previously washing well in clear water, then wash off alkali bath and commence real development. Plates so treated, however, must be allowed a little more pyro than usual.

Soaking plates for five minutes or more in clear water before washing under running water, after removal from developing solutions, will clear the plate better than washing under the tap alone.

The secret of getting good negatives lies in using a developer strong in all the constituents, and in giving a slightly longer exposure than might otherwise be thought necessary.

Bromide of soda is much better than any other bromide for restraining, used with soda or potash developers.

After plates come out of the hypo while washing, brush them off gently with a soft brush or wad of cotton, to remove all sediment which becomes deposited upon them.

Printing.

Dodge a chalky negative by covering back with tissue or tracing paper and paint with gum arabic over positions of high lights.

With a weak, thin negative, put a piece of light green glass over it in printing frame.

Print weak negatives in diffused light, strong ones in direct sunlight.

Mats for Mounting.

Dark mats are best for heavy shadows, buff for chalky high lights, and cream white or light straw for bright high lights.

H. Edwards-Ficken.

New York.

DOES IT PAY?

For the last two or three years the air has been filled with clamorous voices bewailing the low estate of photography as a business. It is asserted, and with truth, that the demand for the productions of the photographer is constantly growing less, and that prices have become so demoralized that nothing like a fair scale of rates can be maintained. It can not be denied that the blight that has fallen upon us is serious and widespread—the breezes of prosperity have sunk to little puffs that barely flap the sails of our drifting barques. Querulous voices are raised in execration of the Cheap John and the Amateur. Perhaps a little philosophy would be more helpful. We must not forget that effects have a cause and evils sometimes a cure. When the gelatine plate came to the front, new conditions entered into the problem of winning bread by the practice of photography. Hitherto the work of the professional was only in competition with the work of other professionals, and the wet-plate was such a stumbling-block to the man of indifferent skill, that fine work, even regarded from a chemical and mechanical point of view, was rather exceptional, and did not fail to fix the heedless attention of the public. To-day the third-rate man can make as good mechanical work as anybody; and his delight is so great at having become a serious competitor of his betters, businessward, that you can scarcely hold him. He starts the club system; he sends out canvassers; he buys a big camera, and makes 20 by 24's; in short, in his own vernacular, he is working photography for all it is worth.

This same gelatine plate begat the Amateur. Photography, by its aid, has become about the most charming and fascinating pastime in the world. It appeals to both sexes and nearly all conditions of life—it amuses, it instructs, and is useful withal. Primarily the Amateur does not make photographs for money, but when the secondary symptoms set in, you find him accepting "a nominal price," and taking his plates to some professional who prints and finishes, at a price still more "*nominal*," all that the Amateur can sell. This method serves the double purpose of helping the young man to make something, and diverting business from yourself—and besides, it convinces the Amateur and his friends that they have paid very extortionate prices, hitherto, in getting photographs in the regular way. But irrespective of the money side of it, millions of pictures are made every year by Amateurs. It may be urged that it is bits of landscapes, old ruins, waterfalls and whatever is picturesque that are his subjects. That was true at the outset, but many are the portraits, groups, and interiors that he undertakes in this year of grace. And many fine things come from the hands of these non-professionals. Practice is beginning to make them proficient.

I do not condemn the Amateur. It is the most natural thing in the world that such an engaging pursuit should be eagerly laid hold of. But all this helps to supply the demand and cheapen the price.

It is evident that the enormous quantity of work from the two sources here alluded to, has glutted the public with pictures, and made photographs so common that they are no longer popular with what has hitherto been our better class of patrons. And this state of things is, no doubt, to continue.

In a country like this, where competition in everything is so fierce, and especially when an enterprise can be undertaken without a large outlay of capital, we may as well realize first as last, that photographs are going to be made in the same way that hats and bricks are, and at a margin of profit that leaves skill an unconsidered factor. The various mechanical printing processes which have sprung up have taken from the photographer almost wholly the business of supplying prints where large numbers are required, and give an added emphasis to low prices. It is idle to contend against the natural tendencies of things. I have urged in the past that out of all this tumult would come a better appreciation of the resources of photography and a more discriminating taste on the part of the public, that would lead to higher ground for the few photographers who had any claim to be ranked as artists. It may be said that the public would not discriminate between good mechanical results and artistic effects. That would, perhaps, be mainly true for a while. It is but a small class that discriminate in the works of the painter, but that class is large enough, and appreciative enough, to secure the sale of a great many canvases every year for thousands of dollars each. Butter sells for a dollar a pound to fastidious people in our large cities. Will not this class who pay so liberally for choice productions in other directions be equally willing when it is so personal a matter as a portrait, and the work is from the hands of one whose reputation gives it a value beyond a mere likeness? But we must not deceive ourselves. Good technical photography is within the easy powers of many, but artists are few. It is, as with everything else, in this day and generation (and, perhaps, it was so in all generations), "there is room at the top." And it seems to me that whatever room there is, or is to be, for remunerative work, will be found in this direction. There has been a good deal of large, direct portrait work in the last year or two, but one thing that we have got to learn is that something besides unusual size must be present to give such pictures any great or permanent value. The methods of "retouching," which have done so much to degrade smaller sizes when employed upon portrait heads, are about as fatal as anything can be. Also, it may be hoped that the glossy, inartistic albumen paper for such work may give place to paper with a mat surface. Such paper would have other advantages beside doing away with the shine. The stretch of plain paper is hardly appreciable, while, as we all know, albumen paper expands to an extent that amounts to serious distortion. In a face seven inches long, albumen paper will add almost one-half inch to its length, or distort it sideways if the print is made the other way of the paper. A serious trouble is also encountered in the fact that, when using plates of heroic size, we can not afford to use enough of them at the prices that obtain for such work, to do our best. And, finally, I believe that not many of us have the feeling and knowledge of art principles necessary to bring the work up to artistic requirements. Hamlet's instructions to the players is aptly to the point, "*Reform it altogether.*" The public may require to be educated in appreciation, but so do we in performance.

So accomplished a photographer and essayist as H. P. Robinson says there can be no question that ninety-nine per cent of the immense mass of photographs that are produced year after year have no claim to rank as art. There can be no doubt that by the aid of photography, the most charming and satisfactory portraiture in the world can be made. But it must be the work of an artist, and such productions must be mainly personal work—personal work in the sense that a painted portrait is the work of one man who works from his own conception and studies of his subject. Let us hope that in this field of portraiture there is in the future a higher mission than photography has yet accomplished.

G. L. Hurd.

PROVIDENCE, R. I.

OLD FRIEND, KEEP YOUNG.

It is perhaps pardonable of the men who have been in photography so many years as to be known as veterans that they take pride in the distinction.

It is natural that as pioneers they feel from long acquaintance with the familiar path a sense of superiority, and regard the younger class of photographers with indulgence, sometimes pity, sometimes contempt, for what he, the veteran, considers upstartism.

That a young fellow should talk learnedly and flippantly in the presence of the old stager, lauding his own methods and the merits of his works quite unconcernedly of the O. S. and his early achievements, is liable to awaken indignation in the breast of the latter.

That a comparative boy who was taking baby naps in his cradle while the other's name was a household word as a prominent photographer should set up to teach things which had been practiced and forgotten years ago by the veteran seems like an impertinency. Why, this youngling had never buffed a plate, wouldn't know a coating box if he were to stumble over it, yet his self-confidence upholds him in the idea of being a conspicuous figure in the profession. Thus museth the veteran and he waxeth wroth at the gall of the youngster.

Come, old man, old friend, let us talk it over. Yes, I remember your portrait of David Wilmot, "old proviso." I remember the three-quarter standing of Henry Ward Beecher, the full figure of Julia Dean, as Lady Gay Spanker, and the game of chess between a gentleman and his wife with the daughter looking on. They were truly fine pictures for early times. I know they were exhibited to admiring thousands and the papers were full of them, but that is a good while back. A man's fame can not live upon daguerreotypes made thirty years ago.

I don't wish to call you an old fogy, or in any way brush you against the grain, but you can let old friendship stand as a guarantee that we may be plain without being offensive. The world moves and the man who lingers over works of the past, content with admiring what to him is perfection, and which in his mind will stand unequaled for an indefinite period is losing time, and while he halts some other fellow skips ahead.

It is a great mistake to be content, or to grow old in whims or fogyism.

To be progressive, to keep on your feet, and to keep your place at the front, there must be no waiting for others to beat what you have done; go ahead and beat it yourself.

Don't allow yourself to under-estimate the young man new to the work. Don't hesitate to recognize a talent, a knack, an idea, or a method he may possess. Don't lose a chance of learning a lesson from *any* source. Don't fancy your education to be complete and your progress ended. Keep your mind young; be quick to adopt new methods. Bait your hook often.

J. F. Ryder.

Cleveland, O.

SUGGESTIONS ON PRINTING.

Blending Plain Skies.—Frequently a negative is one of the thin kind, which will give a pretty good print, except that the sky will be a little dark; or it may be desirable for effect, to have the sky blend off from a tint at the horizon to almost white paper at the top of the print, or to have one portion lighter than another. This may be managed in various ways.

First, a very simple method is to place the frame in a position where it will receive diffused light only. Then, having a piece of cardboard large enough to protect the parts desired, cut its edge to conform somewhat to the horizon, unless it be nearly straight, and with mucilage attach cotton batting along the edge of the card, and pull it out into thin shreds to gradually blend the edge of the card. The card may then be laid flat upon the printing frame, the cotton doing all the blending, or it may be laid at an angle, the edge with the cotton being raised more or less to allow a little light to pass under.

When in a hurry one can print in the sun, and blend by moving the cardboard constantly. If it is allowed to remain still for an instant, an edge will be the result. It will be found very convenient to keep several cardboards about, with their cotton batting attachment, the edges of the cards differing in outline so as to fit different subjects.

Second, much of the same result may be obtained with tissue paper. Sometimes a piece is pasted over the part of the frame to be shaded, its edge torn roughly and irregularly by wetting the fingers and pulling out bits. Then, with a little vaseline or other oil, oil the paper from the edge back a half inch more or less, being careful to make the paper most transparent at the extreme edge. Often, another narrower piece of tissue paper is put over this, extending a shorter distance towards the horizon, and still a third may be added, if necessary. If the negative is quite thin, put tissue paper all over the frame before putting the other pieces on.

Printing-in Clouds.—When printing-in clouds it is necessary to have the sky of the print nearly or quite unacted upon by the light, which is the case only when a strong negative is used, or the sky protected in some manner while the rest is printing. Sometimes the sky, if thin, is stopped out with Gihon's opaque, or other water color. It takes a very delicate hand and considerable patience when the horizon is at all irregular, and when, as in some marines, vessels are shown with spars and rigging extending up across the sky, it is next to impossible to stop out around them. It can be done only on the film side, and is very troublesome there.

One of the most successful ways of managing such cases, is to coat the film side with a mat or benzole varnish having a fine grain, yet with a sufficient tooth to take a very soft lead pencil. The fine work can be done more easily with the pencil than with the brush, the latter being used after the delicate parts about the horizon, or objects extending above, have been finished. My experience has been, however, that in nine cases out of ten, the cardboard cut to conform more or less nearly to the line of the horizon, with the cotton batting on its edge, could best be used to protect the upper portion and blend gradually to the lower part of the sky. Always keep it in motion to get the best effect.

When the print is all done except the sky, take it out of the frame and select a suitable cloud negative. This is a very important matter. Many cloud negatives might be lighted from quite a different direction than the picture. To bring the two together in the same print would make a combination ridiculous to the thoughtful observer.

Again, the clouds should be in harmony with the picture in other respects. One should have quite a stock of cloud negatives, six to a dozen, to suit all occasions.

It is best to have the cloud negative of a larger size than the print, if possible ; that is, an 8 by 10 for 5 by 8 prints. The part most suitable can then be used. A printing frame larger than the cloud negative is also an advantage. I use a 10 by 12 frame for 8 by 10 cloud negatives and 4 by 5 to 8 by 10 prints, putting in a plain glass on which the negative rests.

Place a piece of yellow post-office paper, or other paper of a yellowish or reddish tint, over the print, and hold it up between the eye and weak diffused light. The horizon line can be seen through the yellow paper; trace it hastily with a pencil, then cut out the yellow paper, notching the horizon edge irregularly with scissors, or by tearing. It may be best to use two or more thicknesses, as the object is to protect the lower portion of the print, keeping high-lights pure while it is again exposed to print in the clouds. Adjust the print on the most suitable part of the cloud negative, with yellow paper protector in proper position. Then, as an additional precaution, fasten upon the front of the printing frame with thumb tacks, a piece of cardboard with cotton batting along the edge, covering the lower portion of the print. Pull out the batting so as to blend nicely with the sky. If skillfully managed, the batting itself will often give a good cloud effect. Usually it will be better to keep the cardboard moving.

If there is a boat with sails extending nearly to the top of the picture, the cardboard can be cut to conform to the shape, and the batting can be so managed as to prevent any hard edges or sudden changes. Often the masts and rigging of boats at anchor extend nearly across the sky, and one is at a loss to know how to stop them out or to print around them when putting in clouds. Don't do either, but print right over them. They are dark already, and the clouds will not make them perceptibly darker.

Flashing.—A negative will sometimes have too strong contrasts, and the lights will be chalky. The print can be improved in some cases by flashing, that is, after taking it from the frame, expose it for a moment or two to diffused light. Again, good effects can frequently be obtained by reducing the extent of high-light, making a focus or central spot to balance some part in shade. Tack the print to a board, prepare a piece of card of the right shape to protect the light desired, fix cotton on its edges, then expose print to diffused light for a few moments, keeping the card in motion. A perfectly flat white sky can be nicely graded from light on the horizon to a proper gray above, in this manner.

Walter S. Goodnough.

Columbus, Ohio.

RETOUCHING ELATINE NEGATIVES WITH RED CHALK AND BLACK CRAYON.

To cover the strongest lines and spots of gelatine negatives superficially, I have of late used black crayon; Faber's black chalk points No. 1 and No. 2, also the best Coute's crayon pencils.

Grinding down the film I have abandoned altogether. I merely roughen it by rubbing it with a piece of calico. To avoid finger-dirt or greasy matter being carried upon the plate, which would eventually destroy the surface for drawing purposes, it is best to enclose a tuft of cotton in the calico and tie up the ends. Thus a tampon with convenient handle is secured, well adapted to do the work, without exposing the surface of the plate to finger-marks. When by long-continued rubbing, gelatine powder clogs up the fabric, it may be cleaned by striking it over the edge of the glass plate.

Crayons should be finely pointed and dexterously handled. To use them with force is required only when drawing-in strong details, high lights in eyes or on jewelry, for the contours of laces, linen, etc. The handles belonging to Faber's "B" and "C" points are too heavy and clumsy, and allow easy breaking of the pencils. It is far better to wind a piece of moistened albumen paper spirally around the pencil, and stick the ends together. This furnishes the best handle I know of.

All crayon retouching is usually rather coarse, and whenever it is necessary should be blended down with paper stump or fine erasing gum, just as is done with crayon drawings upon paper.

When it is desirable to lighten up large surfaces like the dark side of a face in Rembrandt style, or to brighten the shadows of a neck, I dip the point of a soft paper stump in crayon scrapings or black pastel color, lay the color on the negative lightly, and without using much force, blend it carefully and easily over all the various places, and rub in gradually.

Crayon powder intensifies somewhat more than it appears to do. Pastel black is of much purer gray tone.

Another remarkably good material for the brightening up of large planes is extremely fine red crayon (Röthel), which possesses great intensifying properties. I do not use the ordinary kind, but that manufactured by La Franc & Co., of Paris. Couti's red crayons are less appropriate for blending, but are better for putting in points and high lights. Red crayon can not very well be employed for brightening up face shadows, as its color will conflict with that of the lead-pencil afterwards used, but in general landscape work and in frequent cases in portraiture also, it will be found to be a most useful material to work with.

Naturally none will attempt to cover whole surfaces with uniform layers of crayon, especially upon under-exposed plates. With them only a detailing of the shadows is required, or to create harmony between them and the brighter lights, while with other negatives the deeper shadows may require a more thorough covering. The difference in the color of the material used, facilitates judging of the intensity desired to be produced.

Negatives retouched with crayons or crayon powder require a protecting varnish. Red crayon adheres however so tenaciously to the negatives that even de-varnishing a retouched negative can not remove it entirely. Red crayons can be used for retouching upon varnished films as well, also when prepared with the usual media, the compound turpentine retouching fluid, or its modern rival, castor oil, and particularly with great advantage when, after varnishing, a plate requires corrections, like the brightening up of hair or beard.

In ordinary practice graphite is used for that purpose. But varnish never adheres well to graphite, and an intensity like that produced by red crayon can never be obtained with it, besides no additional drawing can be effected upon a graphited ground.

It is preferable to varnish the negative after the crayon retouching, the sketch for the whole work, has been finished, and then continue to work in the usual manner. A direct application of the retouching fluid upon the unvarnished film will obliterate the crayon work.

Anton Baumgartner.

HOBOKEN, N. J.

A SIMPLE ARRANGEMENT FOR THE PRODUCTION OF PHOTO-MICROGRAPHS.

It occurred during the past season, that I was forced—on account of the building of a new laboratory and removal from the old one—to make some photo-micrographs with very inconvenient surroundings and the simplest appliances.

My purpose was to make enlargements from mounted sections of histological objects, with an amplification of from ten to four hundred diameters. These were to be employed instead of camera lucida or other sketches in preparing drawings suitable for the engraver.

While there is nothing radically new in my arrangement, it may present some details of value to any one wishing to construct a simple apparatus, at a slight expense, which shall be at the same time adapted to the production of satisfactory work, within the limits mentioned. For more ambitious attempts—for much higher amplification—a larger and more rigid apparatus would be needed.

A 4¼ by 6½ well made plate-holder was procured, and to it fitted a box about seven inches deep, of half-inch pine. This forms the camera; and clasps must be provided for fixing the plate-holder during exposure and the ground glass frame in focusing. To the box was tacked a bellows capable of extension to about fourteen inches. Directions for bellows-making have been so often given in the year books and journals that I omit the details. Mine is home-made, and the construction occupied about an hour's time, using rubber cloth with manilla paper lining. A plain board front was made, with an opening in the center about one and one-half inches in diameter. A piece of velvet formed into a tube, two inches long, was tacked around the edge of the hole in the front board to provide for connection with the microscope. Four legs were then screwed to the box so as to make the whole about twenty-eight inches high when standing upright. The bellows front must hang perfectly free. An ordinary vertical microscope fitted with a sub-stage attachment for condenser was fixed by buttons to a low table—mine consisted of a box about eight inches high and eighteen inches square. The camera is placed over the microscope; and mine is so made as to admit of easy removal by lifting the box, as the ends of the legs fit into cleats. This enables one to place the camera always in the proper position. As the legs fit into recesses in the cleats, provision should be made for fastening, so as to make the whole rigid while working.

The eye-piece should be removed before placing the instrument in position, and light-tight connection between the camera front and the microscope tube be assured by means of the velvet tubing. A rubber ring over the velvet accomplishes this perfectly.

The whole—micro tube and all—was blackened by laying on, with a soft brush, a mixture of lampblack and thin shellac varnish. A perfect dead or flat black will result if the varnish contains just sufficient shellac to bind the pigment and no more. Ordinary photo varnish answers perfectly if diluted with an equal volume of alcohol—otherwise producing a shiny surface.

As I have said, my camera is home-made. A much neater job would have resulted by calling in the services of the skilled workman; but I was unwilling to wait the motions of this fastidious order of nobility. The bellows should have been conical but I feared such was beyond my skill.

The reader will perhaps remember having seen a description, in the works on microscopy, of an arrangement somewhat similar to mine, in which the camera is supported between vertical rods, thereby admitting of increasing the distance between the objective and the sensitive plate. Indeed my lamented friend, Prof. John C. Draper, than whom no nobler man ever lived, constructed such an instrument; and one of my pleasantest recollections is of that gentleman perched on the top of a rickety step-ladder peering into the camera, focusing the instrument by means of a fishing-rod and making frantic attempts to maintain his equlibrium at the same time. I much prefer to make my photo-micrographs at a short distance without eye-piecing, as a rule employing small plates; and afterwards enlarge from the negative. At this writing the ordinary lenses are in mind; but how far these opinions are liable to modification, after more extended trial of Zeiss' apochromatic lenses, is a matter for conjecture.

In this country of glorious sunlight it is best to take advantage of solar illumination; and if we are but content with moderate magnification—within the limits already named—a heliostat may be dispensed with. I may say, parenthetically, that Prazmowski's (Paris) is the most satisfactory instrument, as it is quickly adjusted and exceedingly well made—costing about fifty dollars to import. An ordinary shaving or toilet mirror was, with me, made to serve perfectly; and we only need a glass cell for holding our copper solution. Mine was

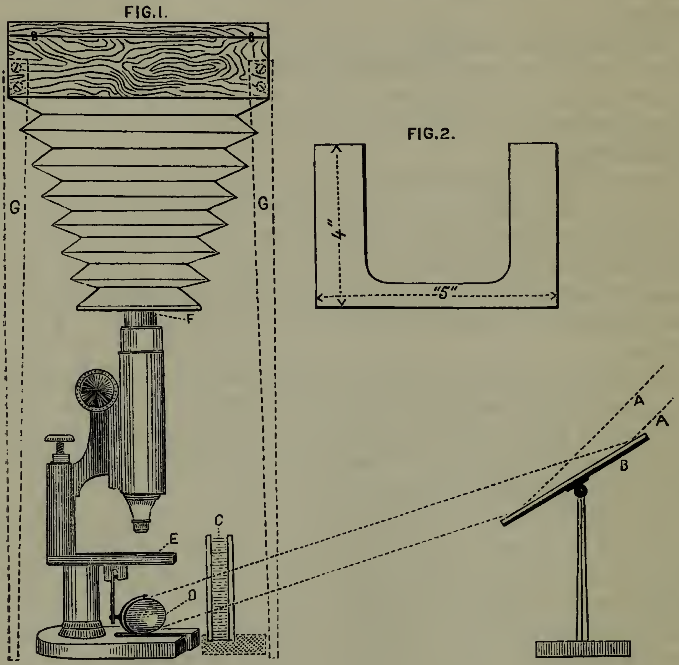


Fig. 1.—The sun's rays *A A*, impinge upon the toilet mirror *B*, and are reflected in the direction of the microscope, through the cell *C*. The mirror should be--preferably—placed on a level with the cell, so that the rays may not be refracted on passing through the latter.

The light is now received by the micro. mirror *D*, and sent—if employed —through the sub-stage condenser (not shown in the cut) and then concentrated upon the object to be photographed, which has been centered upon the stage *E*.

The eye-piece end of the micro. tube *F* having been connected with the camera as described in the text, the image is to be focused upon the ground glass—first covering the head with a focusing cloth.

The camera legs *G G* should be fixed to the low table, upon which the whole is placed, so as to be rigid yet easily removed. The dimensions are given in the text.

Fig. 2 shows the pattern of a piece of wood, to the sides of which plate glass is to be cemented, for constructing the ammonio-sulphate of copper cell.

made by taking a piece of pine five inches long, four inches high, and one-half inch thick, and cutting out a piece as seen in Fig. 2. To either side of this bit of wood was cemented a piece of thin plate-glass the size of the former, using paraffine. I first tied a thread around the whole, holding the parts in position. Then the fag end of a paraffine candle was melted in a spoon and poured into the cell, taking care to avoid covering the free sides of the glass. This was done by tilting the whole and allowing the wax to run around the wood, which should be completely covered wherever the liquid would otherwise come in contact therewith. A stout copper wire inserted in a wood handle and heated from time to time, answers a good purpose for soldering with the paraffine. A bit of wood is screwed to the cell, as seen in the cut, which answers as a foot to keep the whole upright. The top is left open and uncovered ; and, when done using, the cell should be emptied, washed and set away to drain and dry. The copper solution, which is introduced for cutting off the heat of the sunlight as well as certain luminous rays which are not neccessary to our success, is made as follows: Strong liquor ammonia is added, *guttatim*, to a saturated aqueous solution of sulphate of copper until the precipitate first resulting, is dissolved and a clear blue liquid results. If at any time the liquid becomes turbid, a little ammonia will effect a cure. This solution should not be left in the cell to evaporate to dryness and soil the glass, as the latter would be very difficult to clean. The object of leaving the large opening is in order to facilitate the cleansing; and this should be scrupulously done.

In operating, the box or low table supporting the apparatus is placed upon the floor, about ten feet distant from a sunlighted, open window. The light is to be thrown by means of the toilet mirrow upon the mirror of the microscope. For very low powers no sub-stage condenser need be used, and the plain mirror will alone give sufficient illumination. If using any thing higher than a half-inch objective, an achromatic sub-stage condenser will be needed with the plain mirror. Low power objectives make excellent lenses for this purpose, though not of course equal to a well constructed combination intended for this purpose alone.

An object is placed on the stage and the ground glass on the camera-box. The focal adjustments are within easy reach. The first requisite in illumination is to get the sunlight on the micro. mirror; the second, to so adjust the micro. mirror that the light may be central; the third, the adjustment by means of the sub-stage condenser, so that the field may appear evenly lighted. This having been accomplished and the focus obtained, the blue cell should be placed without delay, as the heat from the condensed sun rays otherwise injures the specimen, to say nothing of the objective. The cell is made to stand immediately in front of the micro. mirror—as close as may be without actually touching it. Exposure is made by withdrawing a cardboard screen from before the cell a sufficient length of time. Don't attempt to expose by drawing the slide of the plate-holder.

A word as to time of exposure. With low powers difficulty will be had in exposing with sufficient rapidity. I rigged an ordinary slide exposer on a stand between the toilet mirror and the microscope—attaching it to a head rest stand so as to enable me to place it at once in the path of the rays. The light can also be controlled by the diaphragms of the stage or of the condenser. For higher powers, *e. g.*, one-sixth to one-tenth, an exposure of a fraction of a second will be ample. It will be understood, of course, that I am speaking of gelatine plates, although our work for many years was done with the wet process.

There need be no difficulty in working with bromo-gelatine, without a heliostat, if attention be paid *at the very last moment before exposure*, to the light. Having gotten the plate ready in the holder, give a last look at the image on the ground glass. Give the micro. mirror a turn, if necessary to centralize the light, and then quickly expose.

My work is chiefly with animal tissues, and the preceding lines have been written with such objects in view. For those who desire to resolve diatom markings, etc., with oblique and variously tortured illumination, my simple arrangement will require additions which would place it beyond the reach of most of those for whom I am writing.

Maurice N. Miller, M. D.

UNIVERSITY OF THE CITY OF NEW YORK.

ON THE SO-CALLED OPTICAL SENSITIZERS.

As Dr. Martin Luther, in times long past, found courage to assail with his ninety-five theses the excrescences grown to the stem of the Christian religion, so will I venture to oppose the absorption theories proclaimed without fundamental reasons.

Resting upon numerous experiments, I have been able to prove that the physical (optical) action of dye-stuffs can offer obstacles only when silver haloids are sensitized for single spectrum colors, and that color-sensitiveness depends solely upon their chemical condition.

The absorption hypothesis, that is, the arbitrary acceptation of an axiom, according to which dye-stuffs, showing an absorption band in the spectroscope, or, better said, which in solution do not allow one or more colored rays to pass, will make bromide of silver sensitive for those colors which they apparently absorb, has been proposed by H. W. Vogel, on the basis of extremely imperfect experiments. Accidentally some colors, eosine among them, have an absorption band (*i. e.*, a dark line) in the vicinity of those spectrum colors, for which they sensitize in reality. But, as Kundt has clearly shown, these lines deviate constantly from the sensitizing maximum.

The number of those dye-stuffs with which a maximum of color-sensitiveness appears in the place of the dark band, is, however, insignificantly small, when we compare them with those numerous colored and uncolored bodies which show in part effects quite contrary to the above hypothesis, and prove also that other bodies without any absorption band possess a decided power to sensitize for single spectrum colors.

I have experimented with more than two hundred substances, dye-stuffs as well as colorless bodies, have tested them spectroscopically and spectrographically, as well as with the color scale, for their sensitizing properties,* and found only with few of them an absorption band near that place in the spectrum for the color of which silver haloids are sensitized. On the other hand, I have met with substances of quite opposite behavior. Incidentally may be mentioned two dye-stuffs, triphenylrosaniline and triphenylrosaniline-di-sulph acid, which both show the same absorption band, are both sensitizers, but sensitize silver haloids for entirely different spectrum colors. I have finally found a large number of colorless substances, as such *not being able to give any absorption band at all*, but still powerful sensitizers for certain parts of the spectrum (atropia, brucia, quinia, æsculine, salicine, etc.).

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* *Photographische Correspondenzen*, Vienna, 1887. Pages 1, 263, 553, etc

Eoside of silver, a chemical combination of bromide of silver and erythrosine, generates and increases yellow sensitiveness, while the dye-stuff not chemically suited can act optically only, as an immediate ray-filter, as it were, and depressingly upon general sensitiveness.

I. T. Schmid says in Orthochromatic Experiences (Orthochromatische Erfahrungun):

"How very little color stuff needs to be contained in a bromide of silver gelatine plate to make it highly yellow-sensitive is shown by the following experiment from my own practice: An erythrosine colored emulsion was, after being chilled, pressed into nodules, digested in alcohol for eight days (the decanted alcohol of strong erythrosine color), washed for eight hours in running water, re-liquified and plates coated with it. These plates showed sensitometrically 19 to 29 deg. W., and yellow sensitiveness to such high degree as to make them serviceable for practical orthochromatic work." Herr Schmid questions now: "What has produced action in this case; has the extremely small quantity of dye retained in the emulsion, but not perceptible to the eye, acted as an optical sensitizer, or has the dye partially united with the silver bromide, forming a chemical combination?"

The experience of Herr Schmid, a very clever photographer, and the manager of Angerer & Szekely's extensive dry-plate works, justifies, as will be perceived, my own views on the invalidity of the optical sensitizer theory.

We must consider it a cautious concession to these facts when Prof. Dr. Eder says: *

"The majority of the sensitizing bands of dyes and bromide of silver, when in a much diluted state, appear like feeble shadows. With increased concentration the absorption band becomes more perceptible, and, as a rule, grows to a more or less distinct maximum and towards a constant position in the spectrum. With still stronger concentration superfluous quantities of the dye [Those not having chemically united with the bromide of silver. The author.] produce disadvantageous influences upon the quantitative general sensitiveness of the dyed bromide of silver, and, if the dye is present in very great excess, it will cause a marked depression of sensitiveness."

The effect of the dye-stuff added is equal to that of a color screen.

Eder here endorses what I maintain by argument, but has elsewhere assailed the same theory. I have said in the essay quoted (page 275): "Nearly all dyes of staining properties,

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* *Vienna Correspondenzen*, 1886, p. 587.

when laid in sufficiently thick films before or upon bromide of silver, must necessarily influence it optically. In that sense they are capable of retarding the passage of certain rays of the spectrum, and, by sufficiently long exposure, allow others to become active. This undisputable fact, identical with the efficacy of ray-filters, has led to naming these dyes optical sensitizers, because their action is, indeed, physical. But it has been noticed that these same sensitizers depress general sensitiveness when employed in concentrated solutions (optical action)."

If these dyes act simply as ray-filters, they can not be termed sensitizers any more or less than the yellow glass screen we place before or behind the lens. Only such substances as are capable of causing an increase of sensitiveness can be properly called sensitizers.

But there are actually substances which not only increase very appreciably the sensitiveness for single rays, but, indeed, for the whole spectrum. To do so optically is, however, quite impossible.

Logically, such sensitiveness can be produced only by molecular motion, a re-grouping of molecules.

I must insist, therefore, upon my views on the subject being correct, and deny totally the existence of optical sensitizers.

C. Schiendl.

VIENNA.

ALUM IN THE HYPO BATH.

Every photographer who has worked dry-plates in very hot weather, no doubt has met with the annoyance of frilling and softening of the film, when developing and fixing solutions and the water used for washing the plates were of a high temperature.

Frilling is an expansion of the gelatine film, which causes its partial or complete detachment from the glass. The softening of the film may cause its partial or complete solution. Both are fatal to the negative, and more than disgusting to the operator, who may thereby lose valuable negatives.

To overcome this difficulty has been the aim of the manufacturer, as well as that of the operator, and the remedy which has been found most successful, is, to render the film hard and insoluble by the application of alum. Either chrome alum or ordinary alum is used for the purpose. If chrome alum is added to the emulsion, the latter will not liquefy again after it once has set, and the plates prepared with such an emulsion are very firm, but the advantages derived in this way are at the expense of sensitiveness and other fine qualities.

It is much better not to use alum in the emulsion, as the same beneficial effect can be obtained by using alum in the hypo bath, as practiced by many operators and recommended by high authorities (Dr. Eder, for instance). Many operators use a separate alum bath before or after fixing, but nothing is so effective and practical as the use of a fixing bath containing *equal quantities* of alum and hyposulphite of soda, as it renders the film insoluble, so that there is no danger of frilling in the subsequent washing, even if warm water should be used. The fixing bath for summer use should be prepared as follows:

Dissolve two pounds hyposulphite of soda, one-half pound bicarbonate of soda, two pounds powdered common alum, in two gallons of water.

The bath will at first be turbid, owing to a precipitation of alum, but will become perfectly clear if left standing for a couple of days. It should be prepared in advance, and allowed to settle until clear, when the liquid should be decanted for use.

The combined bath will naturally fix somewhat slower than the plain hypo bath, but this has the advantage that the fixing will be thorough, and no yellow staining will be liable to occur, as with the plain hypo bath. The combined hypo and alum bath holds out longer without discoloring and gives the negatives a beautiful clearness and fine color, and much improves their permanency. A long immersion in this bath (for instance, over night) will intensify the negative, and this can be used to advantage for negatives which are too thin.

After the negative is well fixed, the film will be hardened so thoroughly that it will be found difficult to scratch it, and any amount of subsequent washing will not injure it.

The only care to be taken in hot weather is to carry the negative safely through the developing. The developer can easily be cooled below 65 degrees Fahrenheit by preparing an alkaline stock solution which is diluted with an equal part of ice water. The use of cool and diluted developer in summer has not only the advantage of preventing frilling, it also works much clearer and better than a strong or warm developer. While washing the plate after developing, do not let a strong stream of water from the hydrant pour on the plate, simply leave the plate in the dish while changing the water a couple of times before passing it into the above described fixing bath, and once there, the alum will take care of it and prevent all danger of further injury.

The addition of bicarbonate of soda (as given in the formula) is not absolutely necessary, but it seems to have the advantage of keeping the bath longer in good working order.

Try this bath when the hot weather comes again and you will be pleased with the result.

G. Cramer.

St. Louis.

THE UNDEVELOPED SIDE OF PHOTOGRAPHY.

No one questions the *raison d'être* of photography. It needs no defense, but rather its votaries need spurring to bring forth all that it is capable of.

The higher standard we demand of photography is on the æsthetic side. The work of most photographers to-day betrays a painful deficiency in the knowlede of the principles of art. They exalt meretriciousness and lose all subtle refinement and elegance. They confuse art with artifice, and "the quest of the ideal" is lost in the quest for cheap effects.

In photography to-day the mere likeness of a subject does not, or should not satisfy us; we ought to demand character, poetry, imagination—or in other words, artistic completeness, of which these are characteristics.

Here and there throughout the world are found photographic artists worthy the name, whose work shows this thoughtful character, I had almost said genius, which Taine defines as the faculty for taking infinite pains; he might have added, combined with deep observation. But their number is yet too small. Many give us excellent chemical results, but few add character. An artist will catch a pose that expresses the traits of his sitter, but with the photographer poses have about as little expression as telegraph poles and are about as interesting, while the same accessories serve for poet and peasant.

Again, we have too much imitation and too little individuality. If Sarony or any of his artistic confreres hits a clever pose of some theatrical celebrity, we soon find many imitations of it and often with the most striking inaptitude. I have heard photographers complain there was no longer such a thing as a new pose. One might as well declare there were no further variations of the human countenance possible, but such variations will continue as long as there remain varying shades of character. Surroundings may be the same for a hundred persons, but each sitter comes with his own thoughts, his own character.

The indolent, the unawakened mind will wonder how he can produce an effect, but the man of observation, of perception, will ask himself how he can best express the character of his sitter, and so produce the desired artistic result.

Not alone in the realm of portraiture but in other fields as well has photography yet a vast æsthetic mission to perform in its service as the handmaid of art; in bringing to the homes of the people a better knowledge of the creations of art. It is permitted to but few of our toilers in shops and mills to know by actual contact the beauty of the old creations—the carvings in wood or ivory, the tapestries, the exquisite forms in iron, glass, or pottery wrought by Flemish or Venetian workmen. No mere description can put these products before the eyes of our workers, and expense of reproduction prevents their becoming familiar.

Something has been done in photographing the paintings and sculptures of European galleries, but the large realm of applied art which would exert a great influence on our commercial products, offers an almost unexplored field for the photographer of artistic knowledge.

Again, to awaken the minds and open the eyes of the people to better observation of the beauties of Nature—to see the mountains, the sea, the moving clouds and the shadows they cast across the hillsides or the bosom of the lakes, the changing lights on the river and on the trees—in fact all the fairy magic wrought by the sun's light; to see something besides the material wants of man, to lift him out of the street and the marts of trade when his working hours are over, to recreate him by making him happy and filling his mind with thoughts of the beauty and freedom of the world and his possession of it all, what a field is open!

Wendell Stanton Howard.

CHICAGO.

ON THE PHOTOGRAPHY OF SOLAR ECLIPSES.

In the present state of science many of the most important questions relating to the physical constitution of the sun can be studied only during total solar eclipses, and hence the anxiety of astronomers to observe these phenomena whenever they occur upon accessible parts of the earth's surface. Expensive expeditions are fitted out and sent hundreds, or perhaps thousands, of miles for that purpose. Frequently they are defeated by bad weather at the critical moment, but even when the sky is propitious all their work must be crowded into the three or four minutes of totality, and to make the most of these precious moments recourse is naturally had to photography. The proper estimation of the exposures to be given to the plates then becomes of vital importance, for there is no time to rectify mistakes, and the opportunity once lost is gone forever. The object of the present article is to collect the experience acquired in past eclipses respecting exposure coefficients, and to present it in a form readily available for future use.

We shall need the following formulæ:

$$t = C\left(\frac{f}{a}\right)^2 \qquad (1)$$

$$w = \frac{t}{t'} \qquad (2)$$

$$f = \frac{I}{2\ tan\ \frac{1}{2}\ S} \qquad (3)$$

$$C = t\left(\frac{a}{f}\right)^2 = t\left(\frac{a\ I}{2\ tan\ \frac{1}{2}\ S}\right)^2 \qquad (4)$$

$$C = wt'\left(\frac{a}{f}\right)^2 = wt'\left(\frac{a\ I}{2\ tan\ \frac{1}{2}\ S}\right)^2 \qquad (5)$$

In which

t = duration of exposure, expressed in seconds of time ;
a = clear aperture of the objective employed ;
f = focal distance of the objective, or if a secondary magnifier is used to produce an enlarged image, then f is the *equivalent focal distance*, computed by means of formula (3) ;
I = linear diameter of the image formed upon the sensitive plate ;
S = angular diameter of the body as seen in the heavens ;
w = width of slit in the exposing slide, expressed in inches ;
t' = time in seconds required by the exposing slide to travel one inch ;
C = exposure coefficient.

Before considering the corona, it will be useful to inquire what is the proper exposure coefficient for photographing the uneclipsed sun upon wet collodion plates. The accessible data for the solution of that problem are as follows:

In the "British Association Report," 1859, p. 137, and in the "Philosophical Transactions," 1862, p. 377, Dr. Warren de la Rue gives the following data for negatives of the sun made with the Kew photoheliograph: $a = 2.00$ inches, $I = 3.81$ inches, $\frac{1}{2}\ S = 15' \ 47''$, $w = 0.05$ to 0.025 of an inch. The value of t is not stated, but it was probably about 0.02 of a second. With these data formula (3) gives $f = 414.9$ inches, and then by formula (5), $C = 0.000000023$ to 0.000000012.

In the "American Journal of Science," May, 1865, vol. 39, pp. 304–9, Mr. L. M. Rutherfurd gives the following data for negatives of the sun made with his own telescope, which was specially corrected for photographic use: $a = 1.00$ inch, $I = 4.0$ inches, $\frac{1}{2}S = 16' 01''$, $t = 0.02$ of a second. Whence by formula (3), $f = 429.3$ inches, and then by formula (4), $C = 0.000000108$.

In his report on the total solar eclipse of August 7, 1869 (Appendix II to the Washington Observations for 1867), pp. 121–162, Dr. Edward Curtis gives the following data for negatives of the sun made with the astronomical telescope which he used: $I = 4.18$ inches for the moon during the eclipse, $\frac{1}{2}S = 16' 36''$, whence by formula (3), $f = 432.8$ inches. Also—

DATE.	*a*	*w*	*C.*
1869.	in.	in.	
July 26	2.5	0.438	0.000000218
" 28	2.5	.281	140
" 29	2.0	.500	159
" 30	2.5	.250	124
" 31	3.0	.312	223
Aug. 2	4.0	.500	635
" 3	2.0	.250	079
" 4	2.5	.250	124
" 7	7.75	.500	2382
" 8	2.0	.500	159
" 9	2.0	0.500	0.000000159

The exposing slide had a total play of 2.5 inches, and on November 16, 1887, the time occupied by it in traversing the middle inch of its path was measured with a tuning-fork making 443.6 vibrations per second, and was found to be 6.6 vibrations of the fork, or 0.0149 of a second. With that value of t', and $f^2 = 187316$, the values of C given in the table above have been computed from the corresponding values of *a* and *w* by means of formula (5). On August 2 and 7 the atmosphere was so hazy that the results for these days should be excluded. The mean from all the others is $C = 0.000000153$.

From a large number of experiments made by the present writer in 1874, with one of the U. S. transit of Venus photoheliographs the following data were obtained for negatives of the sun: $a = 5.05$ inches, $f = 465.7$ inches, $w = 1.50$ inches, $t' = 0.01$ of a second, which is an average value determined from measurements made with the tuning-fork described above. Whence, by formula (5), $C = 0.000000106$.

TABLE II.—EXPOSURE COEFFICIENTS FOR THE SUN.

DATE.	OBSERVER.	C.
1859	De la Rue	0.000000023
1865	Rutherfurd	108
1867	Curtis	153
1874	Harkness	0.000000106

The results we have obtained for C are collected in Table II, where the value got from De la Rue's data seems abnormally small. However, the mean of the results from the work of De la Rue and Curtis is only one-fifth less than that from the work of Rutherfurd and Harkness, and

For making photographs of the sun upon wet collodion plates in perfectly clear weather we may safely adopt

$$C = 0.000000100 \qquad (6)$$

Passing now to the consideration of the eclipsed sun, Table III exhibits all the data I have been able to collect for determining the exposure coefficient of the corona. Most of the columns are sufficiently explained by their headings, the letters having the same significations as in formulæ (1) to (5), but it is necessary to add that in the column "Process" the letter D signifies daguerreotype; C, wet collodion; E, dry collodion emulsion; and G, gelatine. The last column gives the height of the corona depicted upon the plate, 1′ being used to indicate that only the prominences and the outline of the moon were shown. It would occupy too much space to mention in detail all the sources from which the table was compiled, but it may be stated generally that the data in it were taken either from Mr. Ranyard's account of observations made during total solar eclipses, in the "Memories of the Royal Astronomical Society," vol. 41, pp. 512–720, or from the original authorities which he has there cited; except No. 6, which is from the "Washington Observations" for 1867, Appendix II, pp. 121–162; Nos. 14 and 15, which are from the "Washington Observations" for 1876, Appendix III, pp. 31, 52, 284 and 286; No. 18, from the "Philosophical Transactions," 1884, p. 254; and No. 19, from "Anthony's Photographic Bulletin," October 22, 1887, vol. 18, p. 614.

TABLE III.—DATA CONCERNING PHOTOGRAPHS OF THE SOLAR CORONA, OBTAINED DURING TOTAL ECLIPSES.

REF. NO.	ECLIPSE AND OBSERVER.	STATION.	*a*	*f*	*t*	*C*	PROCESS.	HEIGHT OF CORONA.
			in.	in.	s.			′
	1851, July 28.							
1	Dr. A. L. Busch................	Königsberg, Germany	2.4	30.	84	0.538	*D*	6
	1860, July 18.							
2	Dr. Warren de la Rue	Rivabellosa, Spain.............	3.4	414.9	60	0.004	*C*	1
3	Padre A. Secchi.......	Desierto de las Palmas....	5.9	98.4	60	.215	*C*	4
	1868, Aug. 18.							
4	Col. J. F. Tennant..............	Guntoor, India................	9.0	81.4	5	0.061	*C*	1
5	Mr. Fred. Wm. Sutton..........	Mantawalu Kiki..	3.5	66.	7	.020	*C*	0
	1869, Aug. 7.							
6	Dr. Edward Curtis..............	Des Moines, Iowa.............	7.75	432.8	66	0.002	*C*	1
7	Prof. F. Himes.................	Ottumwa, Iowa	6.0	230.6	16	.011	*C*	1
8	Prof. Alfred M. Mayer..........	Burlington, Iowa..............	6.42	222.0	7	.006	*C*	1
9	Prof. Joseph Winlock.....	Shelbyville, Ky...............	5.5	90.	40	.149	*C*	5

	1870, Dec. 22.							
10	Prof. Joseph Winlock	Jerez de la Frontera	....	....	90	....	C	10
11	Mr. A. Brothers................	Syracuse, Sicily................	3.0	30.	8	0.080	C	15
	1871, Dec. 12.							
12	Col. J. F. Tennant.............	Dodabetta, India..............	4.0	33.	15	0.220	C	15
13	Mr. H. Davis.........	Baikul, India..................	4.0	33.	17	.250	C	20
	1878, July 29.							
14	Prof. Wm. Harkness............	Creston, Wyoming	6.00	37.89	60	1.505	E	16
15	Mr. Jos. A. Rogers.............	La Junta, Colo................	5.99	38.21	60	1.474	E	18
16	Dr. Henry Draper......	Rawlins, Wyoming............	5.0	78.	165	0.678	C	13
17	Prof. C. F. Brackett	Cherry Creek, Colo...........	6.0	92.	25	.107	C	10
	1882, May 17.							
18	Capt. W. de W. Abney	Egypt	4.0	63.25	23	9.092	G	30
	1887, Aug. 19.							
19	Mr. Karelin....................	Jurgewitz, Russia..............	6.0	....	0.02	0.001	G	4

NOTES TO THE TABLE.

No. 2.—The focal distance has been computed from $I = 3.81$ inches, $\frac{1}{2} S = 15' 47''$.

No. 6.—Focal distance computed from $I = 4.18$ inches, $\frac{1}{2}S = 16' 36''$. The resulting value of C has been diminished from 0.021 to 0.002 on account of a dense haze.

No. 7.—Focal distance computed from $I = 2.12$ inches, $\frac{1}{2}S = 15' 48''$.

No. 8.—Focal distance computed from $I = 2.04$ inches, $\frac{1}{2}S = 15' 48''$.

No. 19.—A Ross portrait lens and a drop-shutter were used. By assuming an intensity ratio of $f \div 4$, the value of C was found to be 0.00125.

The two series of negatives of the total eclipse of July 29, 1878, taken respectively by Mr. Jos. A. Rogers at La Junta, Colo., and by the present writer at Creston, Wyo., seem to prove that to a distance of at least 15′ or 20′ from the sun's limb, the extent of the corona depicted upon a negative is proportional to the square root of its exposure coefficient. Putting h for the height in minutes of arc to which the corona extends above the sun's limb in any negative, we might therefore write $C = n\,h^2$, and proceed to determine n by the method of least squares from all the data given in Table III; but the labor involved in so doing is not warranted by the accuracy of our observed values of C, all of which are necessarily affected both by the varying transparency of the atmosphere during different eclipses, and also by possible changes in the intrinsic brightness of the corona itself. By a much briefer process, partly graphical and partly numerical, the formula

$$C = 0.004\,h^2 \qquad (6)$$

has been obtained, which represents the data in Table III with all the accuracy that can be expected from the nature of the case.

It is generally believed that the best daguerreotype plates are nearly as sensitive as wet collodion, but according to the experiments of Dr. Henry Draper, such is not the case. His work on the moon showed them to be five or six times slower than collodion. With respect to the relative speed of gelatine and wet collodion accurate data are much needed, and at the present time we can only say that the most sensitive gelatine is thought to be about sixty times faster than collodion. If in the absence of more exact knowledge we assume the relative exposures for daguerreotype plates, wet collodion, and highly sensitive gelatine to be as 5, 1, and 0.025, then for the exposure coefficient of the corona we shall have from formula (6):

$$C = 0.0200\,h^2 \text{ for daguerreotypes.} \qquad (7)$$

$$C = 0.0040\,h^2 \text{ for wet collodion.} \qquad (8)$$

$$C = 0.0001\,h^2 \text{ for gelatine.} \qquad (9)$$

These formulæ are probably the best attainable from the experience now on record, and their use will at least tend to prevent a repetition of the mistakes of the past. To make their meaning apparent at a glance Tables IV and V have been computed from them, and from formula (1).

TABLE IV.—EXPOSURE COEFFICIENTS REQUIRED FOR DAGUERREOTYPE PLATES, WET COLLODION, AND GELATINE IN ORDER TO MAKE PICTURES OF THE CORONA EXTENDING TO THE DISTANCES SPECIFIED ABOVE THE SUN'S LIMB.

HEIGHT OF CORONA.	VALUES OF *C*.		
	Daguerreotype.	Wet Collodion.	Gelatine.
1′	0.020	0.004	0.0001
3	.180	.036	.0009
5	0.500	.100	.0025
10	2.000	.400	.0100
15	4.500	0.900	.0225
20	8.000	1.600	.0400
25	12.500	2.500	.0625
30	18.000	3.600	0.0900

TABLE V.—EXPOSURES REQUIRED BY GELATINE PLATES, FORTY TIMES MORE SENSITIVE THAN WET COLLODION, IN ORDER TO MAKE PICTURES OF THE CORONA EXTENDING TO THE DISTANCES SPECIFIED ABOVE THE SUN'S LIMB.

HEIGHT OF CORONA.	INTENSITY RATIO.					
	f ÷ 2	*f* ÷ 3	*f* ÷ 4	*f* ÷ 6	*f* ÷ 8	*f* ÷ 16
	DURATION OF EXPOSURE.					
′	s	s	s	s	s	s
1	0.0004	0.0009	0.0016	0.0036	0.0064	0.0256
3	.0036	.0081	.0144	.0324	.0576	.2304
5	.0100	.0225	.0400	.0900	.1600	0.6400
10	.0400	.0900	.1600	.3600	0.6400	2.5600
15	.0900	.2025	.3600	0.8100	1.4400	5.7600
20	.1600	.3600	0.6400	1.4400	2.5600	10.2400
25	.2500	.5625	1.0000	2.2500	4.0000	16.0000
30	0.3600	0.8100	1.4400	3.2400	5.7600	23.0400

Hitherto, cameras mounted upon equatorial stands and driven by clockwork have been absolutely necessary for taking satisfactory photographs of the corona, but Table V shows to what an extent such cumberous and expensive machinery may now be dispensed with. By means of gelatine plates and portrait lenses the entire corona can be photographed in a single second, or less; and for exposures of that duration clockwork is not a necessity. Astronomers are few, and so long as they alone had the apparatus required for photographing the corona, few pictures of it could be made during an eclipse, but now that gelatine plates have rendered satisfactory work possible with simply mounted portrait lenses, it is to be hoped that during the total eclipse of January 1, 1889, which will be visible in California and our northwestern Territories, every camera within the zone of totality will be employed, and scores of pictures will be obtained. Those who attempt this work must not forget that owing to the great range of brightness in different parts of the corona, its details can not all be shown upon a single plate. A series of pictures are necessary, timed to show heights of say 3, 5, 10, 20 and 30 minutes.

Wm. Harkness.

WASHINGTON, D. C.

OVER-EXPOSURE AND THE MEANS TO CORRECT IT.

A SLIGHT over-exposure may be corrected by the usual addition of a few drops to the ounce of developer of a 10-per-cent solution of bromide of potass, but with excessive over-exposure a citrate is preferred. It might be supposed that either the citrate of ammonia or soda could be used, but recent experiments have taught me that ammonia citrate should be chosen only when ammonia is the alkali used in the developer, for if used in connection with potash or soda, free ammonia is liberated and the chances are a pink-stained negative. As carbonate of soda and carbonate of potash are in general use in America to correct over-exposure, we advise the use of citrate of soda made as follows: Dissolve one ounce (437½ grains) of citric acid in four fluid ounces of distilled water, add of a saturated solution carbonate of soda sufficient to just neutralize, then add water to make ten ounces, and you have a 10-per-cent solution of citrate of soda. One dram to three ounces of developer, containing about one-third or half usual quantity of alkali, will save a very much over-exposed plate. Instead of trying to get printing density by first development of an over-exposed plate, we prefer to develop until all detail is well out and the shadows not too much covered over, and depend on getting printing density afterwards by redevelopment with gallic acid and silver, as recently published by Messrs. Cassebaum and Bartlett, a very much better negative is secured. We will add a word of caution here, and that is, do not carry the redevelopment with gallic acid and silver too far, as it will dry with more intensity than it looks to have, owing to the deposit being so fine.

Instantaneous exposures to give the best result should be treated in development according to speed of exposing shutter and subject. Some will give best results by using same developer as for a time exposure; others may require a more powerful developer, for instance, a seashore or marine view, using a very rapid plate and shutter at a speed of a fiftieth or seventy-fifth of a second with ^{f} stop, will generally respond to a normal developer of say two drams of a one in four solution carbonate of soda (dry granular) or potash, in four ounces of water, the exposed plate to be immersed in this for one minute, then rinsed well under the tap. Before returning plate to the pan, add to the water and alkali three drams of solution of pyro and sulphite of soda (one part of the former and four of the latter in sixteen ounces of water), and two drops of a 10-per-cent solution of bromide potass, keeping the solution in gentle motion and covered from the light. Give time to the development, and if at the end of three minutes full development is not secured, a half to one dram more of the soda or potash may be added.

From an exposure of from one hundredth to two hundredths of a second, from a half to one ounce of a 25-per-cent solution of soda of potash to three ounces of water may be used, and after bathing the plate and washing, three to four drams of pyro solution may be added, and two or three drops of a 10-per-cent solution bromide potass. The development will be more rapid than with former developer. This strong developer requires care in using, especially in hot weather, and the plate should be passed into alum solution as soon as the developer is rinsed off.

Negatives too intense may and can be safely reduced (this is best done directly after leaving the fixing bath and before the hypo solution is washed out), by laying the negative in a weak solution of ferricyanide of potash if a general reduction is desired, or applying the same locally with a soft sable pencil, watching closely the reduction and washing the negative in order to stop it.

While "the means" here given have proved practical in the writer's hands in the correction of errors in exposure and development, "the end"—a perfect negative—is best secured by a correct exposure of the plate in the camera, and an intelligent use of the developer combined with all the art knowledge one can command.

John Carbutt.

PHILADELPHIA.

A NEW DEVELOPER.

No. 1.

Sulphite of sodium	20 grams.
Ferro cyanide of potassium	50 grams.
Carbonate of soda	50 grams.
Water	200 grams.

No. 2.

Pyrogallic acid	10 grams.
Chloride of ammonium	10 grams.
Water	100 grams.

No. 3.

Trimethylamir, 5-per-cent solution.

To develop take of No. 1, 70 grams; of No. 2, 15 grams, and 5 grams of No. 3. Plates develop rapidly, and appear in color like those on wet collodion films.

Trimethylamir may be taken in solutions from 5 to 10 parts in 100 parts of water. It is advisable to employ in the beginning of the developing process but from 3 to 5 parts of the solution, and increase its strength to 6 and 8 as the process goes on.

In place of trimethylamir carbonate of ammonia in saturated solution has been proposed, but its action is far less energetic.

No. 1 and No. 2 are durable, but the trimethylamir should be added to them immediately before being used.

In our large cities the above developer has been in use for more thon two years. The formula is sold there for from twenty-five to fifty marks. The writer of this, fully convinced of the compound's extreme fine qualities, takes pleasure in giving it herewith to the photographic fraternity.

A Russian Amateur.

DZIUNKOW, Russia.

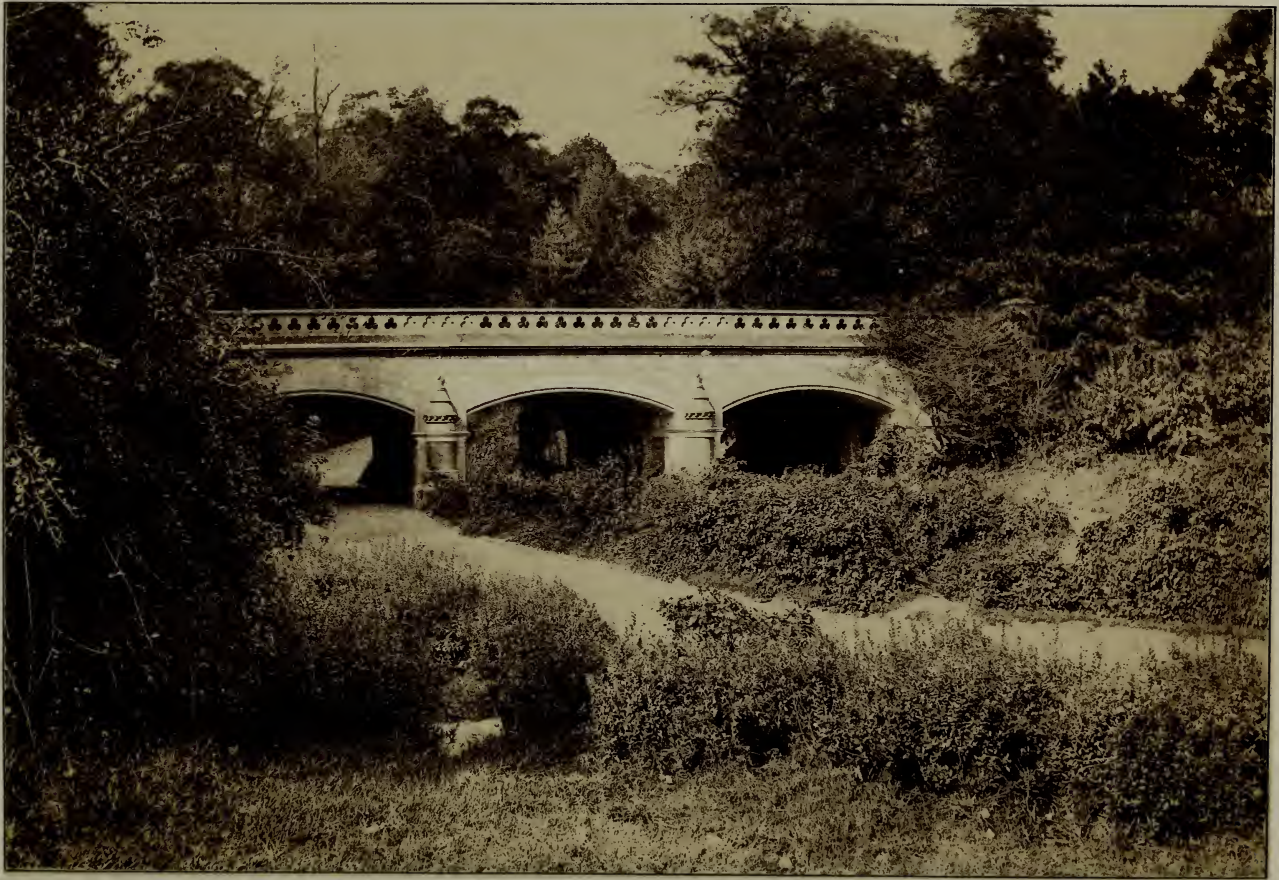

PHOTO-LITHOGRAPH FROM NATURE.—BY THE PHOTO-GRAVURE CO. N.Y.

STANDARD FORMULÆ.

PREPARED BY CH. EHRMANN.

STANDARD FORMULÆ. | MEMORANDA.

THE WET COLLODION PROCESS.

No. 1. NEGATIVE COLLODION.

Equal parts of ether and absolute alcohol. Dissolve in each ounce

Pyroxyline	5 grains.
Iodide ammonium	5 grains.
Bromide cadmium	2 grains.

No. 2.

Ether	6 ounces.
Alcohol	6 ounces.
Pyroxyline	72 grains.
Iodide ammonium	60 grains.
Bromide potassium	36 grains.

No. 3. COLLODION (LIESEGANG'S).

Plain Collodion.

Alcohol	300 c.c.m.
Ether	300 c.c.m.
Pyroxyline	10 grams.

Sensitizer.

Alcohol	200 c.c.m.
Iodide ammonium	6 grams.
Iodide potassium	3 grams.
Bromide potassium	2 grams.

Mix in equal parts.

No. 4.

A.—Sulphuric ether	20 ounces.
Alcohol	10 ounces.
Pyroxyline	2½ drams.
B.—Iodide of cadmium	90 grains.
Iodide of ammonium	90 grains.
Bromide of ammonium	40 grains.
Alcohol	10 ounces.

One part of B (the iodizing solution) must be added to three parts of A, which ought to be labelled "plain collodion."

No. 5. *Plain Collodion.*

Alcohol	5 ounces.
Ether	10 ounces.
Pyroxyline	100 grains.

Sensitizer.

Alcohol	5 ounces.
Iodide ammonium	60 grains.
Iodide cadmium	30 grains.
Bromide cadmium	20 grains.

After perfect solution, mix.

No. 6.—FERROTYPE COLLODION (ESTABROOKE'S).

Iodide of ammonium	30 grains.
Iodide of sodium	10 grains.
Iodide of cadmium	20 grains.
Bromide of cadmium	20 grains.
Ether and alcohol (of each)	5 ounces.
Pyroxyline, sufficient quantity.	

No. 7.—Collodion for the Reproduction of Line Work (Volkmer's).

Plain Collodion.

Ether	500 grams.
Alcohol	400 grams.
Pyroxyline	16 grams.

Sensitizer.

Chloride of calcium	1.6 grams.
Iodide ammonium	4.7 grams.
Iodide cadmium	7.8 grams.

Dissolve in 100 grams of absolute alcohol, and mix with the collodion.

No. 8. Silver Bath.

Nitrate of silver	1 ounce.
Distilled water	10 ounces.

Iodize and acidulate with nitric acid.

No. 9.

Nitrate of silver	10 grams.
Distilled water	100 grams.
Solution of iodide of potassium, 1:100.	2.5 grams.

Acidulate only if the bath grows weak.

No. 10. (*Liesegang's.*)

Distilled water	150 c.c.m.
Nitrate of silver	10 grams.

If the bath fogs, add a few drops of iodine solution (1 part iodine to 10 parts alcohol.)

No. 11. *Silver Bath for Line Work.*

Water	12 parts.
Nitrate of silver	1 part.
Nitric acid, ch. p., a few minims.	

To 1 liter of bath add 20 c.c.m. of

Iodide potassium	6 grams.
Iodine	1 gram.
Water	500 c.c.m.

No. 12. *Rapid Silver Bath.*

Nitrate of silver	35 grains.
Boric acid	4 grains.
Water	1 ounce.
Iodide potassium, sufficient quantity.	

Acidulate with nitric acid.

No. 13.—Ferrotype Bath (Estabrooke's).

Water	½ gallon.
Nitrate of silver	4 ounces.
Iodide potassium	2 grains.

Dissolve, sun for three or four hours, filter and acidulate.

No. 14. DEVELOPERS.

Protosulph. of iron	1 ounce.
Acetic acid	1 ounce.
Water	16 ounces.

No. 15.

Sulphate of iron and ammonia	25 grams.
Acetic acid	50 c.c.m.
Water	400 c.c.m.

No. 16.

Saturated solution of sulphate of iron	2 ounces.
Acetic acid	1 ounce.
Water	18 ounces.

No. 17.—*For Hard Negatives* (*Line Work*).

Water	100 c.c.m.
Sulphate of iron	5 grams.
Tartaric acid	1 gram.

No. 18.

Water	1000 c.c.m.
Sulphate of iron	36 grams.
Sulphate of copper	12 grams.
Glacial acetic acid	50 c.c.m.
Alcohol	40 c.c.m.

INTENSIFIERS.

No. 19.

Saturated solution of sulphate of iron	20 c.c.m.
Acetic acid	10 c.c.m.
Citric acid	5 grams.
Water	200 grams.

And silver solution.

No. 20.

Pyrogallic acid	1 gram.
Citric acid	3 grams.
Water	80 c.c.m.

And silver solution.

No. 21.—*For Reproductions of Line Work.*

A.—Bromide of potassium	¼ ounce.
Water	4 ounces.
B.—Sulphate of copper	½ ounce.
Water	4 ounces.

Mix equal parts of A and B and pour on the film. When perfectly whitened, blacken with nitrate of silver. 30 grains to 1 ounce.

For higher intensity, use hydrosulphate of ammonia, 1 part in 4 parts of water.

In place of the hydrosulphate may be used—

Schlippe's salt	10 parts.
Caustic ammonia	5 parts.
Water	100 parts.

No. 22.

Red prussiate of potash	2 drams.
Nitrate of lead	3 drams.
Water	12 ounces.

Immerse the fixed negative till thoroughly whitened; wash, and flood with a solution of hydrosulphate of ammonia, 1:4.

No. 23.

Water	1 liter.
Red prussiate of potash	50 grams.
Nitrate of uranium	50 grams.
Sugar	50 grams.
Sulphuric acid	30 minims.

DRY COLLODION PROCESSES.

No. 24.—For Collodio-Bromide Emulsion.

Ether, sp. g.: .720	5 fluid ozs.
Alcohol. sp. g.: .820	3 fluid ozs.
Pyroxyline	50 grains.
Bromide of cadmium and ammonium	80 grains.
Or bromide of zinc	76 grains.

Sensitize by adding to each ounce 15 grains of nitrate of silver, dissolved in a few drops of water and one dram of boiling alcohol. This is suitable for slow landscape work or transparencies.

No. 25. For Washed Emulsions.

A.—Ether, sp. g. .720	4 fluid ozs.
Alcohol, sp. g. .820	2¼ fluid ozs.
Pyroxyline	40 grains.
Castile soap dissolved in alcohol	30 grains.
Bromide of ammon. and cadmium	84 grains.

Sensitize with 100 grains of nitrate of silver dissolved in 1 ounce of boiling alcohol. and after standing ten days, add a further 20 grains of silver, dissolved in 2 drams of alcohol.

Rapid.

B.—Ether, sp. g. .720	4 fluid ozs.
Alcohol, sp. g. .820	2½ fluid ozs.
Pyroxyline	40 grains.
Castile soap	30 grains.
Bromide of ammon. and cadmium	56 grains.

Sensitize with 125 grains of nitrate of silver, dissolved as before in 1 ounce of alcohol with the aid of heat. In twelve hours' time add 30 grains more of the double bromide of ammonium and cadmium, dissolved in half an ounce of alcohol.

No. 26.—Washed Emulsion for Transparencies.

Ether, sp. g. .720	5 fluid ozs.
Alcohol, sp. g. .820	3 fluid ozs.
Pyroxyline	60 grains.
Bromide of cadimium and ammonium	100 grains.
(or bromide of zinc	90 grains.)
Hydrochloric acid, sp. g. 1.2	8 minims.

Sensitize with 20 grains of nitrate of silver to the ounce, dissolved in a minimum of water with 2 drams of boiling alcohol. Allow to stand for two or three days.

The emulsion, after being allowed to ripen, should be poured into a dish and allowed to become thoroughly dry. The mass of dry emulsion is then washed, to remove all soluble salts, and is then again dried and redissolved in equal parts of ether and alcohol, at the rate of from 20 to 24 grains to the ounce of the solvents.

No. 27.—Organifiers for Unwashed Emulsions.

For Landscape Work.

A.—Tannin	½ ounce.
Gallic acid	60 grains.
Water	20 fluid ozs.
B.—Tannin	300 grains.
Water	20 fluid ozs.

No. 28.—*For Landscapes or Transparencies* (*Warm Brown Tone*)

C.—Freshly ground coffee	1 ounce.
Boiling water	1 pint.

No. 29.—*For Transparencies* (*Brownish-Black Tones*).

D.—Tannin	30 grains.
Pyrogallol	60 grains.
Water	20 fluid ozs.

No. 30.—Developing Solution for Collodion Emulsion.

A.—Pyrogallol	96 grains.
Alcohol	1 fluid oz.
B.—Bromide of potassium	10 grains.
Water	1 fluid oz.
C.—Liquor ammonia, sp. g. .880	1 fl. dram.
Water	15 fl. drams.
or D.—Carbonate of ammonia	2 grains.
Water	1 fluid oz.

For each dram of developer take for a normal exposure 5 minims of A, 1 or 2 minims of B, and 1 or 2 minims of C, or if D be used, add the above quantities of A, B and C to 1 dram of D. When the details of the image are out, add double the quantity of B and C.

No. 31.—Intensifying Solution for Collodion Emulsion Negatives.

Nitrate of silver	60 grains.
Citric acid	30 grains.
Nitric acid	30 minims.
Water	2 ounces.

To each dram of a three-grain solution of pyrogallol, add 2 or 3 minims of the above, and apply until sufficient.

THE GELATINO-BROMIDE OF SILVER PROCESS.

Developing Formulas.

No. 32.—J. Carbutt's Alkaline Developer.

A.—Water distilled, or ice	10 ounces.
Sulphite of soda crystals	4 ounces.

Dissolve and add slowly

Sulphuric acid	1 dram.
Pyrogallol	1 ounce.
Water to make up 16 fluid ounces.	
B.—Water	10 ounces.
Carbon. of potass., ch. pure., gran.	2 ounces.
Carbon. of soda, granulated	2 ounces.

N. B.—During summer add 30 grains of bromide of potassium to A; for portraits on instantaneous plates, to 4 ounces of water add 3 drams of A and 2 drams of B. More of B to be added if under-exposed, and more of A, with a few drops of a 10 per cent. solution of bromide of potassium, if over-exposed.

No. 33.—Developing Formula for Carbutt's Gelatino-Albumen Opals and Transparencies.

A.—Neutral oxalate potash	8 ounces.
Warm distilled or water from ice.	32 ounces.
Citric acid	60 grains.
B.—Sulphate of iron	4 ounces.
Distilled or ice water	32 ounces.
Sulphuric acid	8 drops.

Fixing Solution.

C.—Hyposulphite of soda	4 ounces.
Water	20 ounces.

Clearing Solution.

D.—Water	20 ounces.
Citric acid	½ ounce.
Alum	1½ ounces.

Developer for Transparencies.

A.—Oxalate solution	2 ounces.
B.—Iron solution	1 ounce.

Pouring B into A.

Place solution in developing dish and lower plate into it, letting the developer flow over in one even wave; develop until detail in high lights is plainly visible, wash off developer and fix in C solution; when quite cleared of all unreduced bromide, wash well, immerse one or two minutes in D, again thoroughly wash and finish by going over the surface with a swab of absorbent cotton, while water runs over the plate; dry spontaneously.

Development of Opals.

To be viewed by reflected light should be continued until the detail in high lights is just visible, remove from developer and flow over a 5 grain solution bromide potass, wash and immerse in alum solution 3 to 5 minutes, wash again and fix in clean fresh hypo solution for not less than 10 minutes. Do not let any white light reach the plate till after fixing. Opals to be viewed by transmitted light should be developed until the detail in high lights is plainly visible and increased density given to the darker parts, then finished as above with a final and thorough washing.

No. 34. Cooper's Formula.

A.—Sulphite of soda	6 ounces.
Distilled water	1 quart.

After dissolved, add

Pyrogallol	1 ounce.
B.—Carbonate of soda, pure	4 ounces.
Water	1 quart.

Take equal parts of A, B and water. Restrain with bromide of potassium 1 ounce to water 6 ounces.

No. 35. CRAMER'S DEVELOPER.

(Formula No. 11.)

Alkaline Solution.

Sulphite of sodium crystals	6 ounces.
Carbonate of sodium crystals (sal soda)	1½ ounces.
Water	64 ounces.

The alkaline solution as well as the sulphite of sodium must be kept in well stoppered bottles. If old and decomposed it will cause yellow stain.

If dried or granular sulphite of sodium is used, 3 ounces will be found equal to 6 ounces crystals.

Twelve drams carbonate of sodium crystals (sal soda) are equivalent to 5 drams carbonate of sodium dried or 6 drams carbonate of potassium.

Pyro Solution.

Distilled or pure ice water	6 ounces.
Sulphuric acid	15 minims.
Sulphite of sodium crystals	1 dram.
After this is dissolved, add pyrogallic acid	1 ounce.

The solution should have a bright yellow color and smell like burning sulphur, owing to the liberation of sulphurous acid, which preserves the pyro.

Developer.

During cold weather use 8 ounces alkaline solution and from 2 to 4 drams pyro solution; keep moderately warm (from 65 to 70 degrees Fahrenheit).

In hot weather add to 4 ounces alkaline solution 4 ounces cold water and from 2 to 4 drams pyro solution, and keep it cool (below 60 degrees Fahrenheit).

Developer, which is too warm, or contains too much carbonate of soda or potassium, will work foggy.

Three drams pyro solution will generally be found sufficient for 8 ounces developer to produce good intensity, if the plates are not over exposed and if the development is carried on far enough.

The developer can be used repeatedly.

When fresh, it answers best for short exposures.

After having been used once or twice it will work with more contrast and clearness. Therefore it is well to add a little old developer to the new. For over-exposed plates old developer should be used, and if much over-exposed, restrain by adding to the developer a few drops of bromide solution (1 ounce bromide of potassium to 10 ounces of water).

An under-exposed plate should be treated with diluted developer, weak in pyro, for instance: 4 ounces alkaline solution, 1 dram pyro solution and 8 ounces of water; use plenty of solution, keep it cool and change it several times if the exposure has been so short as to require prolonged development.

No. 36. BEACH'S FORMULA.

A.—*Pyro Solution.*

Warm distilled water	2 ounces.
Sulphite of soda	2 ounces.

Dissolve, and when cold add

Sulphurous acid	2 ounces.
Pyrogallol	¼ ounce.

B.—*Potash Solution.*

1.—Water	4 ounces.
Carbonate potash, c. p	3 ounces.
2.—Water	3 ounces.
Sulphite soda	2 ounces.

Combine 1 and 2 into one solution.

For a shutter exposure take 3 ounces water, 1½ ounce A, and 3 drams B, increasing the latter to 5 drams if the image hangs back.

For over-exposure, 3 ounces water, 3 drams A, 1 dram B, adding more if neccessary.

No. 37—RANDALL SPAULDING'S DEVELOPER.

A.—Pyrogallol	1 ounce.
Bromide of ammonium	¼ ounce.
Oxalic acid	¼ ounce.
Water	8 ounces.
B.—Saturated solution of carb. of soda	10 ounces.
Saturated solution sulphite soda	2 ounces.

After the plate has been soaked in water, place it in 1 dram of A and 3 ounces of water, and add then 1 dram of B.

STANDARD FORMULÆ.

MEMORANDA.

No. 38. CHAUTAUQUA DEVELOPER.

(*Chas. Ehrmann.*)

A.—Bromide of ammonium	¼ ounce.
Water	8 ounces.
B.—Aqua ammonia	1 ounce.
Water	7 ounces.
C.—Pyrogallol	1 dram.
Water	12 ounces.
Nitric acid	5 minims.

Take for correct exposures of A 40 minims. of B 20 minims, of C ½ ounce and two ounces of water.

No. 39. THE OLD SULPHITE DEVELOPER.

A.—Sulphite of soda	4 ounces.
Water	40 ounces.

Dissolve and add citric acid to a slightly acid reaction, dissolve in it 1 ounce pyrogallol and add bulk to 54 ounces with water.

B.—Aqua ammonia .880	1 ounce.
Bromide of potassium	180 grains.
Water	40 ounces.

Equal parts of A and B will give a 4 grain pyro solution.

No. 40. EDWARDS' GLYCERINE DEVELOPER.

A.—Pyrogallol	1 ounce,
Glycerine	1 ounce.
Methylated alcohol	6 ounces.

Mix the glycerine and spirit and add the pyro.

B.—Bromide of potassium	60 grains.
Liquor ammonia .880	1 ounce.
Glycerine	1 ounce.
Water	6 ounces.

The above stock solutions will keep any length of time.

To make the developer add one part of A to fifteen parts of water, and label the bottle D (developer). In another bottle mix 1 ounce of B with 15 ounces of water and label it A (accelerator).

For use, mix equal parts of D and A; for under exposures increase the proportion of A, and *vice versa.*

No. 41. PHOTOGRAPHIC TIMES CARBONATE OF SODA DEVELOPER.

A.—Pyrogallol	1 ounce.
Sulphite of soda, cryst	4 ounces.
Sulphurous acid	4 ounces.
Water	10 ounces.
B.—Carbonate of soda, cryst	4 ounces.
Sulphite of soda	6 drams.
Water	64 ounces.

Take one dram of A to 1 ounce of B. For under-exposures add more of B; for over-exposures restrain with bromide of potassium 1:10.

No. 42. Photographic Times Pyro and Potash Developer.

A.—Pyrogallol	1 ounce.
Sulphite of soda, cryst	4 ounces.
Sulphurous acid	4 ounces.
Water	10 ounces.
B.—Carbon. of potassa. ch. p	3 ounces.
Carbon. of soda, granul	1 dram.
Water	10 ounces.

Take 1 dram of each, A and B, to 1 ounce of water. Accelerate with B, restrain with bromide or potassium 1:10.

No. 43.—Dr. Stolze's Pyro-Potash Developer.

Modified by Dr. Eder.

A.—Water	200 c.c.m.
Carbon. of potass. ch. p	90 grams.
Sulphite of soda	25 grams.
B.—Water	100 c.c.m.
Sulphite of soda	25 grams.
Pyrogallol	12 grams.

Mix 40 minims of A with 50 minims of B and 100 c.c m. of water.

Bromide of potassium should be used only in minimal quantities, 1 to 3 minims (of a 10 p. c. solution); with more, the general sensitiveness is much reduced.

An alum bath mixed with an equal volume of saturated sulphate of iron solution increases the density and gives the plate a good printing quality.

No. 44.—Developer with Sulphite of Ammonium.

A.—Water	250 c.c.m.
Sulphite of ammon	70 grams.
Pyrogallol	25 grams.
B.—Water	250 c.c.m.
Bromide of ammon	8 grams.
Ammonia	80 c.c.m.

Take 1 c.c.m. of each and 35 c.c.m. of water.

No. 45. Hydrokinone Developer.

A.—Water	80 c.s.m.
Hydrokinone	1 to 2 grams.

B.—Saturated solution of carbonate of ammonia in water.

To 8 parts of A add 1 part of B.

No. 46. Hydroxylamine Developer.

A.—Hydroxylamine chloride	32 parts.
Citric acid	15 parts.
Bromide potassium	20 parts.
Water	480 parts.
B.—Caustic potash	1 part.
Water	8 parts.
C.—Bromide potassium	1 part.
Water	24 parts.

A 4 by 5 plate is soaked in 3½ ounces of water with 46½ grains of A for half a minute, and then add to it from 20 to 30 minims of B. Over-exposures require a few minims of C.

No. 47.—Dr. Eder's Ferrous Oxalate Developer.

A.—	Neutral oxalate potassium	200 parts.
	Distilled water	800 parts.

Acidulate with oxalic acid.

B.—	Sulphate of iron, cryst	100 parts.
	Distilled water	300 parts.
	Sulphuric acid	5 min.
C.—	Bromide of potassium	10 parts.
	Distilled water	100 parts.
D.—	Hyposulphite of soda	2 parts.
	Distilled water	200 parts.

Mix immediately before use 3 parts of A with 1 part B, and develop. Restrain with a few drops of C.

For over-exposures take less of the iron solution, and add gradually in small portions, as required. To give the negative body use C.

To make soft negatives with fine details, take of

A	2¼ ounces.
B	¼ ounce.
C	4 minims.
D	6 minims.

(Not more.)

Plates giving with ordinary developer hard and glassy negatives, give with this modification very satisfactory results.

No. 48.—Ferrous Oxalate Developer with Citric Acid.

A.—	Water	500 parts.
	Sulphate of iron	150 parts.
	Citric acid	2 parts.
B.—	Water	500 parts.
	Neutral oxalate of potass	200 parts.

Boil, and after cooling filter off any crystals that may have separated.

Mix 1 part of A with 4 parts of B. The developer gives very intense negatives.

No. 49. Wilde's Iodine Restrainer.

Alcohol	200 parts.
Iodine	19 parts.
Water	200 parts.

Dissolve in above order; from 8 to 15 drops to 4 ounces iron developer; gives great strength to the negatives.

No. 50.—Belitzki's Method to Remove the Last Traces of Hypo.

Chloride of lime	20 grams.
Water	1 litre.

Add to the milky liquid

Sulphate of zinc	40 grams.

dissolved in from 80 to 100 parts of water, shake well and allow to decant.

The clear, supernatant solution of hypochlorite of zinc is kept in well-closed bottles ; one part of it mixed with 60 parts of water will remove the last traces of fixing soda.

The solution remains active as long as it smells of hypochlorous acid.

No. 51. To Remove Hypo from Films.

A solution of bromine in water, of a light sherry color, destroys the hypo in a gelatine film.

No. 52. Clearing Solution.

Alum	2 parts.
Citric acid	1 part.
Water	10 parts.

No. 53. Edwards' Clearing Solution.

Alum	1 ounce.
Citric acid	1 ounce.
Sulphate of iron	3 ounces.
Water	20 ounces.

This should be freshly mixed.

No. 54. Chautauqua Clearing Solution.

Alum	1 ounce.
Water	15 ounces.
Citric acid	¼ ounce.

No. 55.—Dr. Eder's Method of Intensification.

The negative is whitened by soaking in saturated solution of mercuric chloride, and after thorough rinsing immersed in

Potassium cyanide	10 parts.
Potassium iodide	5 parts.
Mercuric chloride	5 parts.
Water	2000 parts.

No. 56.—*To Intensify with Mercury and Ammonia.*

Pour over the well-washed negative a saturated solution of mercuric chloride; do not keep it on too long, unless the negative is very thin, Wash well and immerse in bath of

Water	10 ounces.
Ammonia	10 minims.

Leave the plate in this solution until the black color goes quite through the film. Wash well.

No. 57.—*Mercuric Intensifier with Sodium Sulphite.*

Whiten the negative in a saturated solution of mercuric chloride, wash and blacken with a solution of sulphite of sodium 1:5. Wash well.

The reduction is perfect, with a positive black tone.

No. 58.—Scolik's Method of Mercurial Intensification.

The fixed and well-washed negative is allowed to remain in the following mercuric chloride bath until the film is thoroughly whitened.

Mercuric chloride	1 part.
Potassium bromide	1 part.
Water	50 parts.

The bleaching being complete, the mercuric solution is rinsed off, and the negative is immersed in a mixture of equal parts of saturated solution of sodium sulphite and water, the darkening action will be seen to take place steadily and slowly just as when ammonia is used. Wash away the excess of sulphite.

No. 59.—Intensifying Solutions for Gelatine Negatives.

Edwards'.

Saturated solution of bichloride of mercury.	10 ounces.
Iodide of potassium	10 drams.

Dissolve the iodide of potassium in 10 ounces of water, and pour gradually into the mercurial solution until the precipitate thrown down is *nearly* re-dissolved. Add 1 ounce of hyposulphite of soda in crystals.

Another.

Mercury bichloride	60 grains in 4 ounces water.
Iodide of potass	90 grains in 2 ounces water.
Hypo	120 grains in 2 ounces water.

Mix.

Mr. William England's.

Mercuric chloride	20 grains.
Ammonium chloride	20 grains.
Water	1 ounce.

Wash the negative thoroughly after fixing and apply the above until the film acquires a uniformly gray tint. Wash again and apply a very weak solution of ammonia—10 drops of the latter to an ounce of water.

No. 60.—*An Intensifier with Cyanide of Silver.*

Mr. J. E. Thompson gives the following: After fixing and washing the plate well, place it in a solution of bichloride of mercury 10 grains, chloride of ammonium 10 grains, water 1 ounce, for a few seconds, until it bleaches. Then wash and place in a bath of cyanide of silver until it blackens, made as follows:

Cyanide of potassium	2 ounces.
Distilled water	48 ounces.
Nitrate of silver	1 ounce.
Distilled water	6 ounces.

Pour the silver gradually into the cyanide, stirring with a glass rod. The quantities given are about right to form a precipitate which will redissolve afterwards. To be used when a few days old.

No. 61. Silver Intensification.

Pyrogallic Solution.

Pyro	15 grains.
Water	10 ounces,

Silver Solution.

Nitrate of silver	60 grains.
Citric acid	30 grains.
Nitric acid	30 minims.
Water	2 ounces.

To each ounce of the pyro solution add 10 or 15 minims of the acid silver, having previously thoroughly removed the hypo from the plate by prolonged washing or by the use of the alum and hydrochloric solution. Should the shadows of the negative become stained during intensification the solution of alum and acid will subsequently clear them almost instantaneously unless the stain be due to the imperfect removal of the hypo. It must be borne in mind that the density increases greatly on drying the negative.

No. 62. *Intensification with Uranium.*

The washed plate should be flooded with a 1 per cent. solution of uranium nitrate, which should be allowed to remain on the plate for about half a minute or so, and then poured back into the measure, into which a few drops of a 2 per cent. solution of potassium ferricyanide has previously been added. The mixed solutions are then poured over the plate, and if sufficient intensity is not obtained, more potassium ferricyanide may be added.

Very permanent, much more so than any of the mercury methods.

No. 63.—Formula for Eastman's Permanent Bromide Paper.

A.—Oxalate of potash	1 lb.
Hot water	3 pints.

Acidify with sulphuric or citric acid. Test with litmus paper.

B.—Proto-sulphate of iron	1 lb.
Hot water	1 quart.
Sulphuric acid (or citric acid ¼ oz)	½ dra
C.—Bromide potassium	1 ounce.
Water	1 quart.

These solutions keep separately, but must be mixed only for immediate use.

To Develop.

Take in a suitable tray—A, 6 ounces; B, 1 ounce; C, ½ dram.

Mix in the order given; use cold. After exposure, soak the paper in water until limp; then immerse in the developer.

The image should appear slowly, and should develop up strong, clear and brilliant. When the shadows are sufficiently black, pour off the developer and flood the print with the

Clearing Solution.

Acetic acid	1 dram.
Water	1 quart.

Do not wash the print after pouring off the developer and before applying the clearing solution.

Use a sufficient quantity to flow over the print, say 2 ounces for an 8x10. Allow it to act for 1 minute and then pour it off and apply a fresh portion; repeat the operation a third time, then rinse in pure water and immerse for 10 minutes in the

Fixing Bath.

Hyposulphite soda	3 ounces.
Water	1 pint.

Enamelling,

Prints on smooth paper ("A" or "B") may be given a beautiful polished surface, superior to that obtained by burnishing, in the following manner: Sprinkle the surface of a glass plate with powdered French chalk, rub it evenly over the surface with a tuft of cotton wool, continuing to lightly rub it until the chalk is all removed, then coat the glass with the following

Collodion.

Soluble gun cotton	48 grains.
Alcohol	4 ounces.
Sulphuric ether	4 ounces.

As soon as the collodion is well set, slide it face up into a tray of water, in which is floating, face down, the permanent bromide print, which has just been fixed and washed, grasp the plate and print by one end and lift together from the water, avoiding bubbles and draining the water from the opposite end; squeegee the print into contact with the plate and set away to dry. Before the print is quite dry apply a coat of starch paste to the back. After drying, the print can be peeled off from the glass, and the face will present a polish almost as high as the surface of the glass from which it has been removed. The print is then ready to mount, as follows: Moisten the face of the mount with a damp sponge and lay it upon the print; rub down with a soft cloth and put under pressure to dry.

Another Method.

Squeegee the wet print, face down, on a polished piece of hard rubber or ebonite, when dry the print will peel off with a fine polished surface. The print should be slipped on to the rubber plate under water to avoid air bells.

Flexible Prints.

Permanent bromide prints soaked in a mixture of glycerine 5 ounces and water 25 ounces, and dried, will not curl, and may be used for book illustrations unmounted. The heavier papers "B" and "C" are especially adapted for this purpose.

Straightening Unmounted Prints.

After drying, prints may be straightened by the scraping action of a sharp-edged ruler applied to the back; the corner behind the ruler being lifted as the ruler is passed along.

No. 64.—Developer for Rapid Printing Paper. (Bromide of Silver Gelatine.)

Black Tones like Platinum Prints.

A.—	Boiling water	500 parts.
	Neutral oxalate potassium	125 parts.

Acidulate with sulphuric acid.

B.—	Boiling water	500 parts.
	Sulphate of iron	185 parts.
	Sulphuric acid	1 part.
C.—	Water	300 parts.
	Bromide potassium	10 parts.

Mix immediately before use in the following proportions: 60 parts of A; 10 parts of B; 1 part of C.

The paper print is first soaked in water and the developer poured upon it. When the picture has been thoroughly developed, remove the iron solution, and, without washing in water, subject it to a solution of

Water	500 parts,
Alum	95 parts,
Acetic acid	2 parts.

for several minutes; wash and fix in a hypo. bath 1.25, and wash.

For Sepia Tones.

Expose twice as long, and reduce the developer to one-half its strength.

For Brown Tones.

A.—Boiling water	160 parts.
Sulphite of sodium	60 parts.
Carbonate of sodium	30 parts.
Pyrogallol	10 parts.

Dissolve the sodium salts in the water and add the pyro. when cold.

B.—Water	60 parts.
Bromide of potassium	10 parts.

Mix 1 part of A with 5 to 6 parts of water and add a few drops of B.

No. 65.—FERROUS CITRO-OXALATE DEVELOPER.

A.—Potassium citrate	700 grains.
Potassium oxalate	200 grains.
Water	3½ ounces.
B.—Ferrous sulphate	300 grains.
Water	3½ ounces.

Mix in equal parts.

No. 66.—CLEARING SOLUTIONS FOR GELATINE NEGATIVES.

Mr. J. Cowell's.

Alum	2 ounces.
Citric acid	1 ounce.
Water	10 ounces.

Wash moderately after fixing, and immerse the negative in the above.

No. 67. THE SILVER PRINTING BATH.

Silver nitrate	50 grains.
Water	1 ounce.

No. 68. MODIFIED SILVER BATH.

Silver nitrate	50 grains.
Ammon. nitrate or sodium nitrate	50 grains.
Water	1 ounce.

To secure a neutral state of the bath a little carbonate of silver should be kept at the bottom of the stock bottle.

No. 69. SPAULDING'S TONING BATH.

Stock Solution.

Water	15 ounces.
Gold chloride	15 grains.

To make up a toning bath for twenty cabinet size prints, take:

Water	10 ounces.
Soda bicarbonate	3 grains.
Common salt	6 grains.
Stock solution of gold	3 ounces.

No. 70. THE PRICE FORMULA.

Into 7½ ounces of water dissolve 15 grains chloride of gold and sodium, then add to it 300 grains of acetate of soda and seven drops of a saturated solution of chloride of lime.

This stock solution should be prepared at least

24 hours before being used. Take ½ ounce of it and mix even with seven ounces of water.

No. 71.—The Photographic Times Toning Bath.

Into 7½ ounces of water put 7½ grains chloride of gold and sodium. Label the bottle containing the mixture: *Chloride of Gold Solution.* Combine 6 ounces of water with 1 *ounce of French azotate*, to which add 1½ ounces of the chloride of gold solution,

No. 72. The Chautauqua Toning Bath.

Dissolve 15 grains of chloride of gold and sodium in 15 ounces of water. Take of this solution 3 ounces, pour it in the toning dish, test for acidity with litmus paper, and *neutralize* with bicarbonate of soda, and add 30 grains of acetate of soda and 30 ounces of water. Prepare the solution an hour before using it.

If warm tones are wanted add a little acetic acid to the first washing water.

For this bath the sensitizing silver should be neutral, for which purpose a small portion of carbonate of silver should be kept in the silver stock bottle.

No. 73.—Charles W. Hearn's Toning Baths.

With Sal Soda.

A.—Distilled or ice water	64 ounces.
Acid sol. of ch. of gold (4 grs. to 1 oz)	1 ounce.
Saturated solution of sal soda	½ ounce.

Should be prepared ½ hour before use.

No. 74. *With Chloride of Lime.*

B.—Water	40 ounces.
Chloride of lime	5 grains.
Chloride of gold	4 grains.

If the chloride of gold is acid, it may be neutralized with carbonate of lime.

No. 75. *With Citric Acid.*

A.—Citric acid	1 ounce.
Water	20 ounces.
B.—Chloride of gold	15 grains.
Water	15 ounces.

Stock Solution.

Take of A 2½ ounces and make slightly alkaline with saturated solution of bicarbonate of soda; of B ½ ounce and 64 ounces of water.

When ready to tone take sufficient of the stock solution, which should never be less than 3 or 4 days old, and add thereto 1 ounce of gold solution B; make alkaline with bicarbonate of soda.

No. 76. *With Bicarbonate of Soda.*

Ch. of gold sol. (1 gr. to the ounce)	1 ounce.
Water	16 ounces.
Saturated sol. of bicarb. of soda	10 minims.

Allow this bath to ripen for one hour. Should be made up fresh for every time toning.

No. 77.—Abney and Robinson's Toning Baths.

A.—Gold trichloride	1 grain.
Sodium carbonate	10 grains.
Water	10 ounces.

Should be used immediately after mixing. This bath gives purple and black tones.

No. 78.

B.- Gold trichloride	2 grains.
Saturated sol. of chloride of lime	2 drops.
Chalk	1 pinch.
Water	16 ounces.

The bath should be prepared with hot water and be kept for one day before using it.

No. 79. Schwier's Borax Toning Bath.

Chloride of gold solution (1.50)	3 c.c.m.
Borax solution (5.100)	100 c.c.m.
Water	100 c.c.m.

Can be used immediately.

No. 80. Dr. Liesegang's Toning Baths.

With Tungstate of Soda.

A.—Boiling water	1 litre.
Tungstate of soda	20 grams.
Chloride of gold	1 gram.

Can be used immediately after cooling.

No. 81. *With Phosphate of Soda.*

B.—Water	1 litre.
Phosphate of soda	15 grams.
Chloride of gold	1 gram.

No. 82. *With Carbonate of Lime* (*Chalk*).

C.– Water	1 litre.
Chloride of gold	1 gram.
Carbonate of soda	15 grams.
Chalk	5 grams.

After 12 hours the bath is perfectly clear and colorless, when it is ready for use. It is very durable and gives fine tones.

No. 83.—*Toning Bath for Ready Sensitized Paper.*

A.—Water	1 litre.
Chloride of gold	1 gram.
B.—Water	1 litre.
Borax	10 grams.
Tungstate of soda	40 grams.

Mix equal parts of A and B three hours before using it.

The print should be somewhat stronger than upon the freshly coated paper.

No. 84. *Printing on Plain Paper.*

Prepare the plain paper with

Ammonium chloride	60 to 80 grains.
Sodium citrate	100 grains.
Sodium chloride	20 to 30 grains.
Gelatine	10 grains.
Distilled water	10 ounces.

Or,

Ammonium chloride	100 grains.
Gelatine	10 grains.
Water	10 ounces.

The gelatine is first swelled in cold water and then dissolved in hot water, and the remaining components of the formula are added The solution is filtered, and when still warm the paper floated upon it for 3 minutes.

The salted paper is sensitized upon a 45-grain silver bath.

No. 85. *Blue Prints.*

A.—Citrate of iron and ammonia	1⅞ ounces.
Water	8 ounces.
B.—Ferri-cyanide of potassium	1¼ ounces.
Water	8 ounces.

Mix equal parts immediately before use and apply to starch-sized paper by means of a Buckle's brush.

No. 86. *Red Prints.*

Citric acid	100 grains.
Chloride of ammonium	100 grains.
Gelatine	10 grains.
Water	10 ounces.

Dissolve the citric acid in a small portion of water, and exactly neutralize with carbonate of soda (228 grains of common washing soda are required).

Float the paper on this bath for 1 to 2 minutes, and sensitize upon a 50-grain nitrate of silver solution.

No. 87. ARISTOTYPY.

Chloride of Silver Collodion.

A.—Alcohol	100 c.c.m.
Nitrate of silver	2 grams.
B.—Alcohol	100 c.c.m.
Chloride of strontium	2 grams.
C.—Alcohol	100 c.c.m
Citric acid	5 grams.
D.—Alcohol	100 c.c.m.
Ether	100 c.c.m.
Gun cotton	4 grams.

To 100 c.c.m. collodion (4) add first, by constant agitation, 10 c.c.m. of B and 10 c.c.m. of C; finally add 5 c.c.m. of A by vigorously shaking the mixture. The formed emulsion is allowed to settle for 24 hours.

Toning Bath.

A—Sulpho-cyanide of ammonium	40 grams.
Hyposulphite of soda	3 grams.
Carbonate of soda	1 gram.
Water	1½ litres.
B.—Chloride of gold	2 grams.
Chalk, a teaspoonful.	
Water	1½ litres.

Mix A and B in equal parts. B must be poured into A, not *vice versa.* Or,

Water	1 litre.
Hyposulphite of soda	120 grams.
Common salt	60 grams.
Chloride of gold and sodium	1 gram.

NO. 88. ORTHOCHROMATIC METHODS.

F. Ives's Chlorophyll and Eosine Process.

Use any good collodio-bromide emulsion that contains no free nitrate of silver. Flow plate as usual, and as soon as the emulsion film sets flow several times with strong alcoholic solution of chlorophyll from blue myrtle or plantain leaves, then immerse in water strongly tinted with with blue shade eosine, and keep in motion until smooth.

Sensitizes to all colors, including deep ruby red; a very light-yellow screen is sufficient to secure correct rendering of color tone.

No. 89. *Eosine Emulsion.*

Eosine (yellowish)	9-10 gram.
Cyanine	1-10 gram.
Water	2,000—3,000 c.c.m.

Six c.c.m. of the solution to 2,000 grams of emulsion.

No. 90. *Chinoline Emulsion.*

Pure bromide emulsion	34 ounces.
Standard chinoline solution	3 drams.
Aqua ammonia	1 dram.

No. 91.—STANDARD CHINOLINE SOLUTION (DR. MALLMAN AND SCOLIK'S).

Alcohol	500 c.c.m.
Chinoline, red	1 gram.

To which are added 50 c.c.m. of a solution of

Alcohol	500 c.c.m.
Chinoline, blue (cyanine)	1 gram.

The above solution is identical with the liquid dye sold under the name ‘ Azaline.”

No. 92.—For Coloring Plates by Bathing.

V. Schumann's Cyanine Bath.

Soak the plate in 200 c.c.m. of water and 2 to 4 c.c.m. of ammonia for 2 to 3 minutes, then immerse in

Distilled water	200 c.c.m,
Alcohol	10 c.c.m,
Ammonia	4 c.c m,
Alcoholic solution of cyanine (1.500)	10 c.c.m,

for not more than 100 seconds, then set the plate on edge in the drying closet.

Develop with "Stolze's" pyro-potassa.

No. 93.—Dr. Mallmann and Scolik's Erythrosine Bath Plates,

Preliminary Bath.

A.—Water	200 c.c.m.
Ammonia	2 c.c.m.

Soak the plate for 2 minutes.

Color Bath.

Erythrosine solution (1.1000)	25 c.c.m.
Ammonia	4 c.c.m.
Water	175 c.c.m.

The plate should not remain longer in this bath than 1¼ minutes. A longer bathing depresses the general sensitiveness.

No. 94. *Chinoline Bath* (*Chautauqua*).

Soak the plate, the emulsion of which should contain but little iodide of silver, for 2½ minutes, in

Water	6 ounces.
Ammonia	30 drops.

And color in

Standard chinoline solution	2 drams.
Water	32 ounces.
Ammonia	1 dram.

No. 95.—To Prepare Yellow Glass Screens.

Take of crushed (not powdered) curcuma root 2 ounces, and macerate in 10 ounces of alcohol for 3 days. After filtering the tincture, mix with an equal bulk of ether, and add to each ounce of the mixture 6 grains of gun cotton.

With this collodion coat the glass plates, which must be perfectly white, thin and without any curvature.

No. 96.—Methods to Reduce the Density of Over-developed Negatives (Farmer's).

Sat. sol. of ferri-cyanide of potassium	1 part.
Hyposulphite of soda solution (1.5)	10 parts.

No. 97. *L. Belitzki's.*

Potassium ferric-oxalate*	1 to 10 grs.
Hyposulphite of soda solution (1.5)	1 ounce.

With either of the processes the plate to be reduced is immersed in the solution, when the reduction will at once commence. The process must be carefully watched so as not to go to extremes Afterwards wash thoroughly. Local reductions can be made by mixing the preparations with gum arabic mucilage and applying it with a soft brush.

No. 98.—Collodion for Porcelain Pictures.

Fennemore's Method.

A.—Negative gun cotton	60 grains.
Alcohol	2 ounces.
Ether	3 ounces.

Dissolve 120 grains nitrate of silver in 3 ounces of hot alcohol, and add by constant stirring to the above collodion.

B.—Chloride of strontium	32 grains.
Citric acid	24 grains.

Reduce to a fine powder and dissolve in 4 ounces of alcohol ; add

Ether	4 ounces.
Gun cotton	60 grains.

The two collodions are to be mixed in equal proportions.

No. 99. *Hearn's Method.*

A.—Alcohol	7 ounces.
Ether	9 ounces.
Gun cotton	112 grains.
B.—Nitrate of silver	480 grains.
Distilled water	1 ounce.
C.—Chloride of calcium	128 grains.
Alcohol	4 ounces.
D.—Citric acid	128 grains.
Alcohol	4 ounces.

Decant 8 ounces of A, add 64 drops of B in small portions, stirring up well after every addition, and 4 drams of C in the same way. Finally 4 drams of D must be added in the same manner as the calcium solution.

No. 100, Printing on Silk.

Boiling water	20 ounces.
Chloride of ammonium	100 grains.
Iceland moss	60 grains.

When nearly cold, filter and immerse the silk for 15 minutes. Sensitize for 15 minutes in an acid 20-grain silver bath, and when dry stretch the fabric over cardboard. Print deeper than usual and tone in

---

*This is the green salt separating in old ferrous-oxalate developer.

Water	20 ounces.
Acetate of soda	2 drams.
Chloride of gold	4 grains.
Common whiting	A few grains.

No. 101. EAU DE JAVELLE.

Dry chl. of lime (hypo chl. of lime)	2 ounces.
Carbonate of potash	4 ounces.
Water	40 ounces.

Mix the chloride of lime with 30 ounces of the water; dissolve the carbonate of potash in the remainder. Mix, boil and filter.

No. 102. LABARRAQUE'S SOLUTION.

Chloride of lime	2 ounces.
Carbonate of soda	4 ounces.
Water	40 ounces.

Mix the chloride of lime with 30 ounces of the water, and dissolve the carbonate of soda in the remainder. Mix, boil and filter.

NO. 103.—FORMULA FOR NEGATIVE VARNISH.

Sandarac	4 ounces.
Alcohol	28 ounces.
Oil of lavender	3 ounces.
Chloroform	5 drams.

No. 104. *Another.*

White hard varnish	15 ounces.
Methylated alcohol	25 ounces.

This will be found a good and cheap varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off. Very suitable for enlarged negatives that are not to be retained.

No. 105. *Another.*

Tough, hard and durable.

Shellac	1¼ ounces.
Mastic	¼ ounce.
Oil of turpentine	¼ ounce.
Sandarac	1¼ ounces.
Venice turpentine	¼ ounces.
Camphor	10 grains.
Alcohol	20 fluid ounces.

No. 106. *Another.*

Sandarac	90 ounces.
Turpentine	36 ounces.
Oil of lavender	10 ounces.
Alcohol	500 ounces.

No. 107. *Another.*

This one may be rubbed down with powdered resin, and gives a splendid surface for retouching.

STANDARD FORMULÆ.

Sandarac	ounces.
Seed lac	1 to 1½ ounces.
Castor oil	3 drams.
Oil of lavender	1½ drams.
Alcohol	18 fluid ounces.

No. 108. NEGATIVE RETOUCHING VARNISH.

Sandarac	1 ounce.
Castor oil	80 grains.
Alcohol	6 ounces.

First dissolve the sandarac in the alcohol, and then add the oil.

No. 109. GROUND GLASS VARNISH.

Sandarac	90 grains.
Mastic	20 grains.
Ether	2 ounces.
Benzole	½ to 1½ ounces.

The proportion of the benzole added determines the nature of the mat obtained.

No. 110. ENCAUSTIC PASTE.

Pure wax	500 parts.
Gum elemi	10 parts.
Benzole	200 parts.
Essence of lavender	300 parts.
Oil of spike	15 parts.

No. 111. — SOLUTION FOR MOUNTING PRINTS WITHOUT THEIR COCKLING.

Nelson's No. 1 photographic gelatine	4 ounces.
Water	16 ounces.
Glycerine	1 ounce.
Methylated alcohol	5 ounces.

Dissolve the gelatine in the water, then add the glycerine, and lastly the spirit.

No. 112. PERMANENT PASTE.

Arrowroot	10 grams.
Water	100 grams,

in which 1 gram of gelatine has been soaked, and boil. After cooling add 10 grams of alcohol and a few drops of carbolic acid.

No. 113. LEATHER COLLODION.

2 p.c. collodion	100 parts.
Castor oil	4 parts.

No. 114.—LUBRICATOR FOR HOT BURNISHING.

Cetaleum	10 grams.
Castile soap	10 grams.
Alcohol	1 kilogramme.

No. 115.—TO REMOVE SILVER STAINS FROM THE HANDS.

Sulphate of soda	½ ounce.
Chloride of lime	¼ ounce.
Water	1 ounce.

MEMORANDA.

Mix thoroughly and apply with an old toothbrush.

No. 116.—Gelatine Solution for Stripping Plates. (Carbutt's.)

Water	9 ounces.
Gelatine	1 ounce.
Glycerine	¼ ounce.

Swell the gelatine in cold water, and dissolve by the heat of a water bath and filter through muslin at a temperature of 100 to 110° F.; flow over the well-dusted negative, using 1 fluid dram of the solution to each 4 square inches of surface. Guide to the edges of the plate with your finger, and remove air bells with a soft-pointed paper. Allow to set in perpendicular position, and when perfectly dry detach the film from the glass. Stripped films may be kept between the leaves of a book.

Plates to be stripped are, previously to coating, prepared for that purpose.

No. 117.—To Make Transparencies on Albumen Paper.

Print on the back of heavily-silvered albumen paper till the picture is perfectly well printed out, by viewing the paper by transmitted light.

Tone and fix as usual, and, when dry, make the paper translucent with

Poppy oil	1 ounce.
Balsam fir	¼ ounce.
Spirits turpentine	½ ounce.

No. 118.—Consumption of Chemicals in Silver Printing on Albumenized Paper.

Of 100 parts of silver used in the albumen printing process will be found

In the finished print	3 p.c.
In filters, blotters and cuttings	7 p.c.
In the wash water before toning	50 to 55 p.c.
In the fixing bath	30 to 25 p.c.
In the wash water after fixing	5 p.c.

Ninety p. c of the silver used may be recovered.

One sheet of paper will take from the silver bath from 30 to 45 grains of nitrate of silver.

One sheet of paper requires to tone 1½ grains of gold (1 centigram).

About 80 or 90 grains of hyposulphite of soda are necessary to fix one sheet of paper.

UNITED STATES MEASURES AND WEIGHTS,

According to Act of 1866 (From Haswell).

MEASURES OF LENGTH.

Denominations and Values.		Equivalents in Use.	
Myriameter	10,000 meters.	6.2138	miles.
Kilometer	1,000 meters.	.62137	mile, or 3,280 ft. 10 ins.
Hectometer	100 meters.	328.	feet and 1 inch.
Dekameter	10 meters.	393.7	inches.
Meter	1 meter.	39.37	inches.
Decimeter	1-10th of a meter.	3.937	inches.
Centimeter	1-100th of a meter.	.3937	inch.
Millimeter	1-1000th of a meter.	.0394	inch.

MEASURES OF SURFACE.

Denominations and Values.		Equivalents in Use.	
Hectare	10,000 square meters.	2.471	acres.
Are	100 square meters.	119.6	square yards.
Centare	1 square meter.	1,550.	square inches.

MEASURES OF VOLUME.

Denominations and Values.			Equivalents in Use.			
Names.	No. of Liters.	Cubic Measures.	Dry Measure.		Wine Measure.	
Kiloliter or stere	1,000	1 cubic meter.	1.308	cubic yards.	264.17	gallons.
Hectoliter	100	1-10th cubic meter.	2	bu. and 3.35 pecks.	26.417	gallons.
Dekaliter	10	10 cubic decimeters.	9.08	quarts.	2.6417	gallons.
Liter	1	1 cubic decimeter.	.908	quart.	1 0567	quarts.
Deciliter	1-10	1-10th cubic decimeter.	6.1027	cubic inches.	.845	gill.
Centiliter	1-100	10 cubic centimeters.	.6102	cubic inch.	.338	fluid oz.
Milliliter	1-1000	1 cubic centimeter.	.061	cubic inch.	.27	fl. drm.

WEIGHTS.

Denominations and Values.			Equivalents in Use.	
Names.	Number of Grams.	Weight of Volume of Water at its Maximum Density.	Avoirdupois Weight.	
Millier or Tonneau	1,000,000	1 cubic meter.	2204.6	pounds.
Quintal	100,000	1 hectoliter.	220.46	pounds.
Myriagram	10,000	10 liters.	22.046	pounds.
Kilogram or Kilo	1,000	1 liter.	2.2046	pounds.
Hectogram	100	1 deciliter.	3.5274	ounces.
Dekagram	10	10 cubic centimeters.	.3527	ounce.
Gram	1	1 cubic centimeter.	15.432	grains.
Decigram	1-10	1-10th of a cubic centimeter.	1.5432	grain.
Centigram	1-100	10 cubic millimeters.	.1543	grain.
Milligram	1-1000	1 cubic millimeter.	.0154	grain.

For measuring surfaces, the square dekameter is used under the term of ARE; the hectare, or 100 ares, is equal to about two acres. *The unit of capacity* is the cubic decimeter or LITER, and the series of measures is formed in the same way as in the case of the table of lengths. The cubic meter is the unit of measure for solid bodies, and is termed STERE. *The unit of weight* is the GRAMME, which is the weight of one cubic centimeter of pure water weighed in a vacuum at the temperature of 40 deg. Cent. or 39.2 deg. Fahr., which is about its temperature of maximum density. In practice, the term cubic centimeter, abbreviated c.c., is used instead of milliliter, and cubic meter instead of kiloliter.

U. S. MEASURES AND WEIGHTS.

ACCORDING TO PREVIOUS AND EXISTING STANDARDS.

LINEAL.

12 inches = 1 foot.
3 feet = 1 yard.
5.5 yards = 1 rod.
40 rods = 1 furlong.
8 furlongs = 1 mile.

Inches.		Feet.		Yards.		Rods.		Furlong.
12								
36	=	3						
198	=	16.5	=	5.5				
7,920	=	660	=	220	=	40		
63,360	=	5,280	=	1,760	=	320	=	8

SURFACE—LAND

144 sq. ins. = 1 sq. ft.
9 sq. ft. = 1 sq. yd.
30.25 sq. yds = 1 sq. rod.
40 sq. rods = 1 sq. rood.
4 sq. roods = 1 acre.
640 acres = 1 sq. mile.

Ft.		Yds.		Rods.		Roods.		Acres
9	=	1						
271.75	=	30.25	=	1				
10,890	=	1,210	=	40	=	1		
43,560	=	4,840	=	160	=	4	=	1
27,878,400	=	3,097,600	=	102,400	=	2,560	=	640

VOLUME—LIQUID.

4 gills = 1 pint.
2 pints = 1 quart.
4 quarts = 1 gallon

Gills.		Pints.		Cub. In.
8				
32	=	8	=	231

FLUID.

Gallon.		Pints.		Ounces.		Drams.		Minims.		Cubic Centimetres.
1	=	8	=	128	=	1,024	=	61,440	=	143,904
		1	=	16	=	128	=	7,680	=	35,488
				1	=	8	=	480	=	2,957
						1	=	60	=	369

16 ounces, or a pint, sometimes called a pound.

TROY WEIGHT.

Pound.		Ounces.		Pennyweights.		Grains.		Grams.
1	=	12	=	240	=	5,760	=	373.24
		1	=	20	=	480	=	31.10
				1	=	24	=	1.55

APOTHECARIES' WEIGHT.

lb. Pound.		℥ Ounces.		ʒ Drams.		℈ Scruples.		gr. Grains.		Grams.
1	=	12	=	96	=	288	=	5760	=	373.24
		1	=	8	=	24	=	480	=	31.10
				1	=	3	=	60	=	3.88
						1	=	20	=	1.29
								1	=	.06
								15½.	=	1.00

The pound, ounce and grain are the same as in Troy weight.

AVOIRDUPOIS WEIGHT.

Pound.		Ounces.		Drams.		Grains (Troy).		Grams.
1	=	16	=	256	=	7000	=	453.59
		1	=	16	=	437.5	=	28.35
				1	=	27.34	=	1.77

TABLES FOR THE CONVERSION OF GRAMS (OR CUBIC CENTIMETRES) INTO OUNCES AND GRAINS.

CONVERSION OF GRAMS INTO GRAINS.

Grams.	Grains.
1	15.43
2	30.86
3	46.29
4	61.73
5	77.16
6	92.59
7	108.03
8	123.46
9	138.89

CONVERSION OF GRAINS INTO GRAMS.

Grains.	Grams.
1	.0648
2	.1296
3	.1944
4	.2592
5	.3240
6	.3888
7	.4536
8	.5184
9	.5832

CONVERSION OF GRAMS INTO TROY OUNCES.

Grams.	Troy Ounces.
1	.03215
2	.06430
3	.09645
4	.12860
5	.16075
6	.19290
7	.22505
8	.25720
9	.28935

CONVERSION OF GRAMS INTO AVOIRDUPOIS OUNCES.

Grams.	Avoirdupois Ounces.
1	.03527
2	.07054
3	.10581
4	.14108
5	.17635
6	.21162
7	.24689
8	.28216
9	.31743

The above tables render the conversion of the weights in question a matter of great ease, the error introduced in the last decimal place being trivial.

The use of the tables will be best illustrated by an example. Supposing that it is desired to find the equivalent in grains of 324.51 grams, we proceed by breaking up this number into the following series of constituent parts, and finding the grain-equivalent of each part from the table:

Portions of original number.	Equivalents in grains.
300.00	4630.
20.00	308.6
4.00	61.73
.50	7.716
.01	.1524
	5008.1984

The required quantity is 5008.2 grains. The numbers taken from the table will, in most cases, require a change as regards the position of the decimal point; thus, to find the value of 300 grams, one refers to the table, and finds 46.30 given as the equivalent, and a mere shifting of the decimal point two places towards the right multiplies this by 100, or gives the required number. In a similar manner, by shifting the decimal place of 30.86 one place to the right we obtain the value in grains of 20 grams; while the number 61.7 is taken from the table without alteration as the equivalent of 4 grams. For .50 the table number must have its point shifted on to the left, making it 7.716 instead of 77.16; and finally, the value of .01 is obtained by shifting the point of 15.43 two places to the left.

The above operations are, in actual practice, performed with considerable speed, the required equivalents being written down one after the other on a scrap of paper, and then added up.

TABLE SHOWING THE COMPARISON OF THE READINGS OF THERMOMETERS.

CELSIUS, OR CENTIGRADE (C). RÉAUMUR (R). FAHRENHEIT (F).

C.	R.	F.	C.	R.	F.
—30	—24.0	—22.0	23	18.4	73.4
—25	—20.0	—13.0	24	19.2	75.2
—20	—16.0	— 4.0	25	20.0	77.0
—15	—12.0	+ 5.0	26	20.8	78.8
—10	— 8.0	14.0	27	21.6	80.6
— 5	— 4.0	23.0	28	22.4	82.4
— 4	— 3.2	24.8	29	23.2	84.2
— 3	— 2.4	26.6	30	24.0	86.0
— 2	— 1.6	28.4	31	24.8	87.8
— 1	— 0.8	30.2	32	25.6	89.6
Freezing point of water.			33	26.4	91.4
0	0.0	32.0	34	27.2	93.2
1	0.8	33.8	35	28.0	95.0
2	1.6	35.6	36	28.8	96.8
3	2.4	37.4	37	29.6	98.6
4	3.2	39.2	38	30.4	100.4
5	4.0	41.0	39	31.2	102.2
6	4.8	42.8	40	32.0	104.0
7	5.6	44.6	41	32.8	105.8
8	6.4	46.4	42	33.6	107.6
9	7.2	48.2	43	34.4	109.4
10	8.0	50.0	44	35.2	111.2
11	8.8	51.8	45	36.0	113.0
12	9.6	53.6	50	40.0	122.0
13	10.4	55.4	55	44.0	131.0
14	11.2	57.2	60	48.0	140.0
15	12.0	59.0	65	52.0	149.0
16	12.8	60.8	70	56.0	158.0
17	13.6	62.6	75	60.0	167.0
18	14.4	64.4	80	64.0	176.0
19	15.2	66.2	85	68.0	185.0
20	16.0	68.0	90	72.0	194.0
21	16.8	69.8	95	76.0	203.0
22	17.6	71.6	100	80.0	212.0
			Boiling point of water.		

Readings on one scale can be changed into another by the following formulæ, in which t° indicates degrees of temperature:

Réau. to Fahr.	Cent. to Fahr.	Fahr. to Cent.
$\left(\frac{9}{4}t^\circ \text{ R}\right) + 32^\circ = t^\circ \text{ F}$	$\left(\frac{9}{5}t^\circ \text{ C}\right) + 32^\circ \quad t^\circ \text{ F}$	$\frac{5}{4}\left(t^\circ - 32^\circ\right) = t^\circ \text{ C}$
Réau. to Cent.	Cent. to Rèau.	Fahr. to Réau.
$\frac{5}{4}t^\circ \text{ R} = t^\circ \text{ C}$	$\frac{4}{5}t^\circ \text{ C} = t^\circ \text{ R}$	$\frac{4}{9}\left(t^\circ \text{ F} - 32\right) = t^\circ \text{ R}$

CONVERSION OF FRENCH BAROMETER MEASUREMENTS INTO ENGLISH.

M. M.	Inches.	M. M.	Inches.	M. M.	Inches.	M. M.	Inches.	M. M.	Inches.	M. M.	Inches.
		640	**25.197**			**700**	**27.560**			**760**	**29.992**
39—	—25.158	41—	—25.237	99—	—27.520	1—	—27.599	59—	—29.882	61—	—29.961
38..	..25.119	42..	..25.276	98..	..27.481	2..	..27.638	58..	..29.843	**762**	**30**
37—	—25.079	43—	—25.315	97—	—27.441	3—	—27.678	57—	—29.804	63—	—30.040
36..	..25.040	44..	..25.355	96..	..27.402	4..	..27.717	56..	..29.764	64..	..30.079
35—	—25.000	45—	—25.394	95—	—27.363	5—	—27.756	55—	—29.725	65—	—30.119
34..	..24.961	46..	..25.433	94..	..27.323	6..	..27.796	54..	..29.686	66..	..30.158
33—	—24.922	47—	—25.473	93—	—27.284	7—	—27.835	53—	—29.646	67—	—30.197
32..	..24.882	48..	..25.512	92..	..27.245	8..	..27.875	52..	..29.607	68..	..30.237
31—	—24.843	49—	—25.552	91—	—27.205	9—	—27.914	51—	—29.567	69—	—30.276
630	**24.804**	**650**	**25.591**	**690**	**27.166**	**710**	**27.953**	**750**	**29.528**	**770**	**30.316**
29—	—24.764	51—	—25.630	89—	—27.126	11—	. 28.993	49—	—29.489	71—	—30.355
28..	..24.725	52..	..25.670	88..	..27.087	12..	—28.032	48..	..29.449	72..	..30.394
27—	..24.685	53—	—25.709	87—	—27.048	13—	..28.071	47—	—29.410	73—	—30.434
26..	—24.646	54..	..25.748	86..	..27.008	14..	—28.111	46..	..29.371	74..	..30.473
25—	..24.607	55—	—25.788	85—	—26.969	15—	..28.150	45—	—29.331	75—	—30.512
24..	—24.567	56..	..25.827	84..	..26.930	16..	—28.189	44..	..29.292	76..	..30.552
23—	..24.528	57—	—25.868	83—	—26.890	17—	. 28.229	43—	—29.252	77—	—30.591
22..	—24.489	58..	..25.906	82..	..26.851	18..	—28.268	42..	..29.213	78..	..30.630
21—	..24.449	59—	—25.945	81—	—26.812	19—	..28.308	41—	—29.174	79—	—30.670
620	**24.410**	**660**	**25.985**	**680**	**26.772**	**720**	**28.347**	**740**	**29.134**	**780**	**30.709**
19..	24.370	61—	—26.024	79—	..26.733	21—	—28.386	39—	—29.095	81—	—30.749
18—	24.331	62..	..26.063	78..	—26.693	22..	..28.426	38..	..29.056	82..	..30.788
17..	24.292	63—	—26.103	77—	..26.654	23—	—28.465	37—	—29.016	83—	—30.827
16—	24.252	64..	..26.142	76..	—26.615	24..	..28.504	36..	..28.977	84..	..30.867
15..	24.213	65—	—26.182	75—	..26.575	25—	—28.544	35—	—28.938	85—	—30.906
14—	24.174	66..	..26.221	74..	—26.536	26..	..28.583	34..	..28.898	86..	..30.945
13..	24.134	67—	—26.260	73—	..26.497	27—	—28.623	33—	—28.859	87—	—30.985
12—	24.095	68..	..26.300	72..	—26.457	28..	..28.662	32..	..28.819	88..	..31.024
11..	24.056	69—	—26.339	71—	..26.418	29—	—28.701	31—	—28.780	89—	—31.063
610	**24.016**			**670**	**26.378**			**730**	**28.741**	**790**	**31.103**
Read up.		Read down.		Read up.		Read down.		Read up.		Read down.	

FRENCH, ENGLISH, AMERICAN AND GERMAN MONEY.

French.	English.	American.	German.	French.	English.	American.	German.
fr. c.	*s. d.*	*dols. c.*	*m. pf.*	*fr. c.*	*s. d.*	*dols. c.*	*m. pf.*
0 05	0 0½	0 01	0 04	2 87.5	....	....	2 30
0 10	0 1	0 02	0 08	2 92	2 4	0 56	....
0 12.5	....	....	0 10	**3 00**	....	....	**2 40**
0 15	0 1½	0 03	0 12	3 02	2 5	0 58	....
0 20	....	....	0 16	**3 12.5**	**2 6**	**0 60**	**2 50**
0 21	0 2	0 04	....	3 23	2 7	0 62	....
0 25	....	....	0 20	3 25	....	....	2 60
0 26	**0 2½**	**0 05**	....	3 33	2 8	0 64	....
0 31	0 3	0 06	0 25	3 37.5	....	....	2 70
0 37.5	....	....	0 30	3 44	2 9	0 66	....
0 42	0 4	0 08	....	3 50	....	....	2 80
0 50	....	....	0 40	3 54	2 10	0 68	....
0 52	0 5	0 10	....	3 62.5	....	....	2 90
0 62.5	**0 6**	**0 12**	**0 50**	3 65	2 11	0 70	2 92
0 73	0 7	0 14	....	**3 75**	**3 0**	**0 72**	**3 00**
0 75	....	....	0 60	3 85	3 1	0 74	3 08
0 83	0 8	0 16	....	3 87.5	....	....	3 10
0 87.5	....	....	0 70	3 96	3 2	0 76	....
0 94	0 9	0 18	....	**4 00**	....	....	**3 20**
1 00	....	....	**0 80**	4 06	3 3	0 78	....
1 04	0 10	0 20	....	4 12.5	....	....	3 30
1 12.5	....	....	0 90	4 17	3 4	0 80	....
1 15	0 11	0 22	....	4 25	....	....	3 40
1 25	**1 0**	**0 24**	**1 00**	4 27	3 5	0 82	....
1 30	1 0½	0 25	1 04	**4 37.5**	**3 6**	**0 84**	**3 50**
1 35	1 1	0 26	1 08	4 48	3 7	0 86	....
1 37.5	....	....	1 10	4 50	....	....	3 60
1 46	1 2	0 28	....	4 58	3 8	0 88	....
1 50	....	....	1 20	4 62.5	....	....	3 70
1 56	1 3	0 30	....	4 69	3 9	0 90	....
1 62.5	....	....	1 30	4 75	....	....	3 80
1 67	1 4	0 32	....	4 79	3 10	0 92	....
1 75	....	....	1 40	4 87.5	....	....	3 90
1 77	1 5	0 34	....	4 90	3 11	0 94	....
1 87.5	**1 6**	**0 36**	**1 50**	**5 00**	**4 0**	**0 96**	**4 00**
1 98	1 7	0 38	....	5 21	4 2	1 00	4 16
2 00	....	....	**1 60**	6 25	5 0	1 20	5 00
2 08	1 8	0 40	....	7 50	6 0	1 44	6 00
2 12.5	....	....	1 70	8 75	7 0	1 68	7 00
2 19	1 9	0 42	....	10 00	8 0	1 92	8 00
2 25	....	....	1 80	11 25	9 0	2 16	9 00
2 29	1 10	0 44	....	12 50	10 0	2 40	10 00
2 37.5	....	....	1 90	13 75	11 0	2 64	11 00
2 40	1 11	0 46	1 92	15 00	12 0	2 88	12 00
2 50	**2 0**	**0 48**	**2 00**	20 00	16 0	3 84	16 00
2 60	2 1	0 50	2 08	25 00	20=£1	4 80	20 00
2 62.5	....	....	2 10	50 00	£2	9 60	40 00
2 71	2 2	0 52	....	75 00	£3	14 40	60 00
2 75	....	....	2 20	100 00	£4	19 20	80 00
2 81	2 3	0 54	....	125 00	£5	24 00	100 00

USUAL SIZES OF FRENCH AND ITALIAN DRY PLATES.

FRENCH.	*Inches.*	ITALIAN.	*Inches.*
6½x 9 Centimetres	2.5x 3.7	9x12 Centimetres	3.7x 4.7
9 x12 "	3.7x 4.7	12x16 "	4.7x 6.3
12 x15 "	4.7x 5.9	12x18 "	4.7x 5.9
13 x18 "	5.1x 7.0	13x18 "	5.1x 7.0
12 x20 "	4.7x 7.8	12x20 "	4.7x 7.8
15 x21 "	5.9x 8.2	18x24 "	7.0x 9.4
15 x22 "	5.9x 8.6	21x27 "	8.2x10.6
18 x24 "	7.0x 9.4	24x30 "	9.4x11.8
21 x27 "	8.2x10.6	27x33 "	10.6x12.9
24 x30 "	9.4x11.8	30x36 "	11.8x14.1
27 x33 "	10.6x12.9	40x50 "	15.7x19.6
27 x35 "	10.6x13.7	50x60 "	19.6x23.6
30 x40 "	11.8x15.7		
40 x50 "	15.7x19.6		
50 x60 "	19.6x23.6		

SIZES OF GLASS, MOUNTS, PAPER, ETC.

Petite cards	1⅝x3⅛
One-ninth plate	2 x2½
One-sixth plate	2¾x3¼
One-fourth plate	3¼x4¼
Half plate	4½x6½ and 4¼x5½
Half plate (English)	4¾x6½
Whole plate (4–4)	6½x8½
Extra 4–4	8 x10

Other sizes are expressed by inches.

SIZES OF MOUNTS.

Stereoscopic	3½x7, 4x7, 4¼x7, 4½x7, 5x8		
Victoria	3¼x5	Minette	1½x2⅜
Imperial	7⅞x9⅞	Card	2½x4⅛
Boudoir	5¼x8½	Cabinet	4¼x6½
Panel	4 x8¼	Promenade	4⅛x7⅛

SIZES OF ALBUMEN PAPER.

18x22¾, 20½x24½, 22x36, 26x40, 27x42.

Size of blotting paper 19x24

FREEZING MIXTURES.

PARTS.	Reducing the Temperature	From Degrees of the Celsius	To Thermometer.
3	Nitrate of sodium+4 Water	+13.2 deg.	— 5.3 deg.
9	Phosphate of sodium+4 dilute Nitric acid	+10 "	— 9 "
3	Sulphate of sodium+2 dilute Nitric acid	+10 "	—10 "
1	Nitrate of sodium+4 Water		—10.6 "
1	Chloride of potassium+4 Water		—11 8 "
5	Sal ammoniac+5 Saltpetre		
1	Nitrate of ammonia+1 Water	+10 deg.	—15.5 deg.
8	Sulphate of sodium+5 conc. Sulphuric acid	+10 "	—17 "
1	Sulphocyanate of Potass.+1 Water	+18 "	—21 "
1	Chloride of sodium+3 Snow		—21 "
1	Sal ammoniac+1 Saltpetre+1 Water	+ 8 deg.	—24 "
3	Crystal. chloride of calcium+1 Snow		—36 "
1	Snow+1 dilute Sulphuric acid	— 5 deg.	—41 "

TABLE OF SYMBOLS, MOLECULAR WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

Abbreviations.—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n.s., not soluble; dec., decomposed; del., deliquescent.

NAME.	SYMBOL.	MOL. WEIGHT.	COLD WATER.	HOT WATER.	ALCOHOL.
Acid, Acetic, Glacial	$HC_2H_3O_2$	60	s.	s.	s.
" Carbolic (see Phenol)	$C_6H_5.H_2O$	94	6:100	s.	s.
" Chlorhydric (see Hydrochloric)					
" Boracic or Boric	H_3BO_3	62	s.	dec.	s.
" Citric	$C_6H_8O_7,H_2O$	210	s.	s.	n. s.
" Digallic (see Tannic Acid)					
" Gallic	$C_6H_2(OH_3COOH,H_2O$	188	sp. s.	sp. s.	20:100
" Formic	H,CHO_2	46			
" Hydrobromic	HBr	81			
" Hydriodic	HI	128			
" Hydrochloric	HCl	365			
" Cyanic	HCy	27			
" Hydrosulphuric	H_2SO_4	34			
" Muriatic (see Hydrochloric)					
" Nitric	HNO_3	63			dec.
" Nitrous	HNO_2	47	dec.	dec.	dec.
" Oxalic	$H_2C_2O_4, 2HO$	126	12:100	s.	s.
" Pyrogallic (see Pyrogallol)	$H_3C_6H_3O_3$	126	30:100	v. s.	v.s.& ether
" Salicylic	$HC_7H_5O_3$	133	n. s.	s.	v.s.& ether
" Sulphuric	H_2SO_4	98			
" Sulphurous	H_2SO_3	82		al	so in ether
" Tannic (see Digallic Acid)	$C_{14}H_{10}O_9$	322	s.	s.	s.
Alcohol, Ethyl	C_2H_5OH	46			
" Methyl (see Wood Alcohol)	CH_3OH	32			
Alum (see Potassium Alumnium Sulphate)					
" Chrome (see Potassium Chromic Sulph.)					
Ammonia, Gaseous	H_3N	17	v. s.		
Ammonium, Bichromate	$(NH_4)_2Cr._2O_7$	253	v. s.	v. s.	

Ammonium Bromide	NH_4Br	97·8	v. s.	v. s.	s.
" Carbonate (see Sal volatile)	$NH_4HCO_3 + NH_4CO_2NH_2$	175	25:100	dec	sp. s.
" Chloride (see Sal ammoniac)	NH_4Cl	534	37:100	1:1	12:100
Ammonium Fluoride	NH_4F	37	v. s.	v. s.	sp. s.
" Iodide	NH_4J	144·6	del.	v. s.	s.
" Nitrate	NH_4NO_3	80	v. s.	v. s.	1;2
" Oxalate	$(NH4)2C_2O_4$	124	v. s.	v. s.	1:2
" Sulphate	$(NH_4)2SO_4$	132	v. s.	v. s.	1:2
" Sulpho-cyanate	NH_4CNS	76	s.	s.	s.
Barium, Bromide	$BaBr_2$	297	1:1	1:0·67	s.
" Chloride	$BaCl_2$	244	43:5·100	78:9·100	n. s.
" Iodide	BaI_2	391	1:0·5	1:0·75	v. s.
" Per-oxide	BaO_2	169	n. s.	n. s.	in hd chl.acid
Bicarbonate of Potassa (see Potassium Bicarb..					
Bicarbonate of Soda (see Sodium Bicarbonate)					
Bichloride of Mercury (see Mercuric Chloride)					
Bromine	Br	79·8	s.	s.	s.
BORAX (see Sodium Biborate)					
Cadmium, Bromide	$CdBr_2$	344	v. s.	v. s.	s.
" Chloride	$CdCl_2$	219	40:100	150:100	s.
" Iodide	CdI_2	366	1:1	1:0·75	s.
Calcium, Bromide	$CaBr_2,4H_2O$	272	s.	s.	s.
" Carbonate (see Chalk)	$CaCO_3$	100	n. s.	n. s.	n. s.
" Chloride	$CaCl_2.6H_2O$	110	del.	del.	n. s.
" Hypochlorite (see Chloride of Lime)	$Ca(ClO)_2CaCl_2$	254	sp. s.	sp.	dec.
" Iodide	CaI_2	294	del.	del.	dec.
Calomel (see Mercurous Chloride)					
Carbonate of Ammonia (see Ammonium Carb.					
Carbonate of Potash (see Potassium Hydrate)					
" of Soda (see Sodium Carbonate)					
Caustic Potash (see Potassium Hydrate)					
" Soda (see Sodium Hydrate)					
Chalk (see Calcium Carbonate)					
Chloride of Lime (see Calcium Hypochlorite)					
Chlorine	Cl	35·4	1:2·5	Volumes.	
Chrome, Alum (see Potassium Chromic Sulph.)					
Copper Acetate (see Verdigris)	$Cu(C_3H_3O_2)_2,H_2O$	199·2	7:100	20:100	7:100

TABLE OF SYMBOLS, MOLECULAR WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

Abbreviations.—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n. s,, not soluble; dec., decomposed; del., deliquescent.

NAME.	SYMBOL.	MOL. WEIGHT.	COLD WATER.	HOT WATER.	ALCOHOL.
Copper Chloride	$CuCl_2,H_2O$	170·5	16:100	v. s.	v. s.
" Sulphate (see Blue Vitriol),	$CuSO_4.5H_2O$	249·2	40:100	203:100	n. s.
" " and Ammonia	$CuSO_4,4NH_3$	245·5	n. s.	n. s.	n. s.
Corrosive Sublimate (see Mercuric Chloride).					
Epsom Salts (see Magnesium Sulphate)					
Glaubers Salt (see Sodium Sulphate)					
Glycerine	$C_3H_5(HO)_3$	92	s.	s.	s.
Gold, Perchloride	$AuCl_3$	302·5	del.	del.	also in ether
Green Vitrol (See Iron Sulphate)					
Haematoxyline	$C_{16}H_{14}O_6H_2,O$	356	del.	s.	also in ether
Hydrokinone	$C_{20}H_{12}O_5$	332	del.	s.	also in ether
Hydroxylamine Ammonia—Chloride	NH_3OHCl		v. s.	v. s.	n. s.
Iodine	I.	126.6	sp. s.	sp. s.	v. s.
Iron, Chloride (Ferric)	Fe_2Cl_6	325	v. s.	v. s.	s.
" " (Ferrous)	$FeCl_2$	127	v. s.	v. s.	s.
" Citrate	$Fe_2(C_6H_5O_7)_2$	597.8	s.	s.	n. s.
" Iodide	FeI_2	310	v. s.	v. s.	v. s.
" Nitrate	$Fe(NO_3)_2, 6H_2O$	288	v. s.	dec.	dec.
" Oxalate (Ferrous)	FeC_2O_4	144	in potass-	ium oxal.	n. s.
" Sulphate (Ferrous)	$FeSO_4,7H_2O$	277.9	60:000	300:000	n. s.
" " (see Green Vitrol and Am.)	$FeSO_4(NH_4)_2SO_4+6H_2O$	392	v. s.	dec.	n. s.
Lead, Acetate (see Sugar of Lead)	$Pb.(C_2H_3O_2)_2.3H_2O$	378.5	12:000	15:100	12:100
" Carbonate	$(PbCC_3)Pb(HO)_2$	773.5	n. s.	sp. s.	n. s.
" Iodide	PbI_2	459.7	1:12.34	1:194	n. s.
" Nitrate	$Pb(NN_3)_2$	330.5	1:2.05	1:0.72	8:100
" Oxide	PbO	222.5	n. s.	n. s.	Alkalis.
Lithium, Bromide	$LiBr$	86.8	v. s.	v. s.	s.
" Chloride	$LiCl$	60.5	65:100	125:100	v. s.
" Iodide	LiI	134	v. s.	v. s.	s.
Magnesium, Bromide	$Mg.Br_2$	184	del.	v. s.	s.
" Chloride	$MgCl_2$	95	150:100	369:100	50:100

Magnesium, Iodide	$Mg.I_2$	278	v. s.	v. s.	v. s.
" Sulphate (see Epsom Salt)	$MgSO_4, 7H_2O$	246	s.	s.	n. s.
Mercury, Chloride (Mercuric) (see Corros. Subl)	$HgCI_2$	270·5	7:100	54:100	1:3
" " (Mercurous) (see Calomel)	Hg_2Cl_2	470·2	n. s.	n. s.	n. s.
" Cyanide	$HgCy_2$	252	12:100	53:100	5:100
" Iodide (Mercuric)	HgI_2	454	1:150	sp. s.	0·8:100
" " (Mercurous)	Hg_2I_2	654	n. s.	n. s.	n. s.
Phenol (see Carbolic Acid)					
Potassa (see Potassium Hydrate)					
Potassium, Aluminium Sulphate (see Alum)	$K_2SO_4.Al_2(SO_4)_3, 24H_2O$	948	9·5:100	357:100	n. s.
" Bicarbonate	$KHCO_3$	100	s.	dec.	n. s.
" Bichromate	$K_2Cr_2O_7$	294·3	1:9·6	1:1	n. s.
" Bromide	KBr	118·8	1:4	1:1	1:200
" Carbonate	$(K_2O_3)_2, H_2O$	330	1:4	1:1	1:200
" Chlorate	$KClO_3$	122·4	1:16	1:2	1:120
" Chloride	KCl	74·5	32:100	65:6·100	0·5:100
" Chromic Sulph. (see Chrome Alum)	$K_2SO_4Cr_2(SO_4)_3, H_2O$	999	v. s.	dec.	sp. s.
" Cyanide	KCy	65	v. s.	dec.	sp. s.
" Ferric Sulphate	$K_2SO_4.Fe_2(SO_4)_3, 24H_2O$	100·6	s.	s.	n. s,
" Ferricyanide (see Red Prussiate)	$K_6(C_3N_3)4Fe_2$	658	1:2·5	1:1·26	n. s.
" Ferro-cyanide (see Yel. Pruss.)	$K_8(C_3N_34Fe_2,6H_2O$	422	28:100	1:1	n. s.
" Iodide	KI	165·6	120:100	1:1	n. s.
" Fluoride	KFl	94	v. s.	v. s.	v. s.
" Hydrate	KOH	56	v. s.	v. s.	n. s.
" Nitrate (see Saltpetre)	KNO_3	101	1:4	1:6·5	n. s.
" Permanganate	$K_2Mn_2O_8$	314	1:15·5	v. s.	dec.
" Platino-chloride	K_2PtCl_6	488·4	1:100	1:10	1:12·8
" Sulphate	K_2SO4	174	1:8	1:4	n. s.
" Sulpho-cyanide	$KCyS$	97	v. s.	s.	s.
Prussiate of Potash, red (see Potassium Ferri-cyanide)					
Prussiate of Potash, yellow (see Potassium Ferro-cyanide)					
Pyrogallol (see Pyrogallic Acid)					
Sal ammoniac (see Ammonium Chloride)					
Sal soda (see Sodium Carbonate)					
Sal tartar (see Potassium Carbonate)					
Saleratus (see Potassium Bicarbonate)					
Sal volatile (see Ammonium Carbonate)					
Salt, common (see Sodium Chloride)					

TABLE OF SYMBOLS, MOLECULAR WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

Abbreviations.—s., soluble; v.s., very soluble; sp. s., sparingly soluble; n.s., not soluble; dec., decomposed; del., deliquescent.

NAME.	SYMBOLS.	MOL. WEIGHT.	COLD WATER.	HOT WATER.	ALCOHOL.
Saltpetre (see Potassium Nitrate)					
Saltpetre of Chili (see Sodium Nitrate)					
Sesqui-Carbonate of Soda (see Sodium Carb.					
Silver, Acetate	$AgC_2H_3O_2$	167	v. s.	v. sl.	n. s.
" Bromide	$AgBr$	188	n. s.	n. s.	in HCl and HBr.
" Carbonate	Ag_2CO_3	276	n. s.	n. s.	n. s.
" Chloride	$AgCl$	143 5	n. s.	n. s.	Ammonia cyan. potass. hypo sulphite. of soda.
" Fluoride	$AgF:H_2O$	144 or 163	v. s.	v. s.	v. s.
" Iodide	AgI	235	n. s.	n. s.	same as Chloride.
" Nitrate	$AgNO_3$	170	1:1	1:2	sp. s.
" Nitrite	$AgNO_2$	154	sp. s.	s.	sp. s.
" Oxide	Ag_2O	231	v. sp.	v. sp.	v. sp.
" Sulphide	Ag_2S	248	n. s.	n. s.	n. s.
Soda, Caustic (see Sodium Hydrate)					
Sodium Biborate (Borax)	$Na_2B_4O_7, 10H_2O$	382	1:1	2:1	n. s.
" Bromide	$NaBr$	102·3	1:2	v. s.	s.
" Bicarbonate	$NaHCO_3$	84	1:12	dec.	n. s.
" Carbonate	$Na_2CO_3, 10H_2O$	286	60:100	420:100	n. s.

Sodium Chloride	$NaCl$	58 5	35:100	39:100	n. s.
" Citrate	$Na_3C_6H_5O_7$	258	1:2	1:3	sp. s.
" Hydrate	$NaHO$	40	60:100	127:100	sp. s.
" Hypo-sulphite	$Na_2S_2O_3$	248	v. s.	v. s.	ins.
" Iodide	NaI	149·6	185:100	300:100	s.
" Nitrate (see Chili Saltpetre)	$NaNO_3$	85	80:100	2:1	n. s.
" Sulph-antimonate	$Na_2SO_4 10, H_2O$	481	s.	s.	n. s.
" Sulphate	$Na_2SO_4, 10H_2O$	322	1:28	1:04	n. s.
" Sulphide	$Na_2S.9H_2O$	240	s.	s.	sp. s.
" Sulphite	$Na_2SO_3, 7H_2O$	252	25:100	1:1	n. s.
" Thio-sulphate (see Hypo-sulphite)					
Strontium, Bromide	$SrBr_2, 6H_2O$	355·5	87:100	250:100	s.
" Chloride	$SrCl_2, 6H_2O$	266·5	33:100	117:100	4:6·100
" Nitrate	$Sr(NO_3)_2$	211·5	20:100	50:100	sp. s.
Sugar of Lead (see Lead Acetate)					
Sulphate Soda (see Sodium Sulphate)					
Tannin (see Digallic Acid)					
Thymol	$C_6H_3(CH_3(C_3H_7)CO,O$	177	sp.		& in ether
Tin, Chloride (Stannic)	$SnCl_4$	260	dec.	in much	water.
" Chloride (Stannous)	$SnCl_2.2H_2O$	225	270:100	270:100	270:100
Uranium, Bromide	$UBr_2.4H_2O$	352	del.	del.	del.
" Nitrate	$UO_2(NO_3)_2, 6H_2O$	384	v. s.	v. s.	v. s.
" Sulphate	$UO_2(SO_4),3H_2O$	302	v. s.	v. s.	v. s.
Verdigris (see Copper Acetate)					
Vitriol, Blue (see Copper Sulphate)					
" Green (see Iron Sulphate)					
" White (see Zinc Sulphate)					
Washing Soda (see Sodium Carbonate)					
Wood Alcohol (see Alcohol Methyl)					
Zinc, Bromide	$ZnBr_2$	225	s.	s.	s.
" Chloride	$ZnCl_2$	136·2	300:100		s.
" Iodide	ZnI_2	319·2	dec.	dec.	dec.
" Nitrate	$Zn(NO_3)_2,6H_2O$	189	del.	del.	del.
" Sulphate (see White Vitriol)	$ZnSo_4,7H_2O$	287	135:100	655:100	n. s.

DR. JANEWAY'S TABLE OF THE SOLUBILITY OF PHOTOGRAPHIC CHEMICALS.

MADE FOR THE SOCIETY OF AMATEUR PHOTOGRAPHERS OF NEW YORK.

Abbreviations.—ins., insoluble; sp. s., sparingly soluble; m. s., moderately soluble; v. s., very soluble; dec., decomposed.

CHEMICALS.	WATER.		COLD ALCOHOL.
	59° F.	212° F.	
One part is soluble in	Parts.	Parts.	
Acid, Citric	0.75	.6	v. s.
Gallic	100	3	m. s.
Oxalic	8	1	v. s.
Pyrogallic	3.5	v. s.	v. s.
Tannic	6	v. s.	v. s.
Alum	10.5	v. s.	ins.
Chrome	10	dec.	ins.
Ammonium, Nitrate	0.5	v. s.	v. s.
Chloride	3	v. s.	sp. s.
Carbonate	4	dec.	m. s.
Sulphocyanate	v. s.	v. s.	v. s.
Bromide	1.5	0.7	sp. s.
Iodide	1	0.5	m. s.
Baryta, Nitrate	8	3	
Cadmium, Bromide	v. s.	v. s.	m. s.
Iodide	v. s.	v. s.	v. s.
Copper, Acetate	15	5	sp. s.
Sulphate	2.6	0.5	ins.
Gold, Chloride	v. s.	v. s.	v. s.
Gold and Sodium Chloride	v. s.	v. s.	m. s.
Iron, Perchloride	v. s.	v. s.	v. s.
Protosulphate	1.8	0.3	ins.
and Ammonia sulphate	3	0.8	ins.
Iodide (Ferrous)	v. s.	v. s.	sp. s.
Iodine	7000		m. s.
Kaolin	ins.	ins.	ins.
Lead, Acetate	1.8	0.5	m. s.
Chloride	v. sp.	33	ins.
Nitrate	2	0.8	ins.
Lithium, Bromide	v. s.	v. s.	m. s.
Iodide	v. s.	v. s.	m. s.
Magnesia, Nitrate	v. s.	v. s.	m. s.
Mercury, Bichloride	16	2	v. s.
Cyanide	12.8	3	ins.
Potassium, Acetate	0.4	v. s.	v. s.
One part is soluble in	Parts.	Parts.	
Potassium, Bicarbonate	3.2	dec.	ins.
Bichromate	10	1.5	ins.
Bromide	1.6	1	sp. s.
Carbonate	1	0.7	ins.
Cyanide	2	1	m. s.
Ferricyanide	3.8	2	ins.
Ferrocyanide	4	2	ins.
Nitrate	4	0.4	ins.
Iodide	0.8	0.5	m. s.
Oxalate	3	v. s.	ins.
Permanganate	20	3	ins.
Sulphate	9	4	ins.
Sulphite	4	5	sp. s.
Sulphuret	2	1	sp. s.
Silver, Nitrate	0.8	0.4	m. s.
Oxide	v. sp. s.	v. sp. s.	ins.
Sodium, Acetate	3	1	m. s.
Bromide	1.2	0.5	m. s.
Bicarbonate	12	dec.	ins.
Carbonate	1.6	0.25	ins.
Citrate	v. s.	v. s.	sp. s.
Hyposulphite	1	v. s.	ins.
Iodide	0.6	0.3	m. s.
Nitrate	1.3	0.6	sp. s.
Phosphate	6	2	ins.
Pyrophosphate	13	1.1	ins.
Sulphite	4	0.9	sp. s.
Sulphate	2.8	0.4	ins.
Tungstate	4.0	2.0	ins.
Strontia, Chloride	1.88	v. s.	sp. s.
Uranium, Nitrate	v. s.	v. s.	m. s.
Zinc, Iodide	v. s.	v. s.	m. s.
Bromide	v. s.	v. s.	m. s.
Chloride	0.33	v. s.	v. s.

TABLE OF ATOMIC AND MOLECULAR WEIGHTS OF THE ELEMENTS.

(Derived from Professor F. W. Clarke's figures.)

Names and Symbols.	Weights.	Apprx Wghts.	Names and Symbols.	Weights.	Apprx Wghts.
Aluminum, Al....	27.0090	27.	Nickel, Ni...	57.9280	57.9
Antimony, Sb....	119.9550	120.	Niobium, Nb.....	93.8120	93.8
Arsenic, As	74.9180	74.9	Nitrogen, N.	14.0210	14.
Barium, Ba......	136.7630	136.8	Osmium, Os.....	198.4940	198.5
Bismuth, Bi......	207.5230	207.5	Oxygen, O.......	15.9633	16.
Boron, Bo........	10.9410	10 9	Palladium, Pd ...	105.7370	105.7
Bromine, Br	79.7680	79.8	Phosphorous, P...	30.9580	31.
Cadmium, Cd....	111 8350	111.8	Platinum, Pt.....	194.4150	194.4
Cæsium, Cs......	132.5830	132.6	Potassium, K.....	39.0190	39.
Calcium, Ca......	39.9900	40.	Rhodium, Rh.....	104.0550	104.1
Carbon, C........	11.9736	12.	Rubidium, Rb....	85.2510	85.3
Cerium, Ce......	140.4240	140.4	Ruthenium, Ru..	104 2170	104.2
Chlorine, Cl......	35.3700	35.4	Scandium, Sc....	43.9800	44.
Chromium, Cr....	52.0090	52.	Selenium, Se......	78.7970	78.8
Cobalt, Co.......	58.8870	58.9	Silicon, Si........	28.1950	28.2
Copper, Cu.......	63.1730	63.2	Silver, Ag........	107.6750	107.7
Didymium, D....	144.5730	144.6	Sodium, Na.......	22.9980	23.
Erbium, E........	165.8910	165.9	Strontium, Sr . ..	87.3740	87.4
Fluorine, Fl......	18.9840	19.	Sulphur, S	31.9840	32.
Gallium, Ga	68.8540	68.9	Tantalum, Ta....	182.1440	182.1
Glucinum, G.....	9.0850	9.1	Tellurium, Te....	127.9600	128.
Gold, Au...	196.1550	196.2	Thallium, Tl.....	203.7150	203.7
Hydrogen, H.....	1.0000	1.	Thorium, Th.....	233.4140	233 4
Indium, In.......	113.3980	113.4	Tin, Sn..........	117.6980	117.7
Iodine, I.........	126.5570	126 6	*Titanium, Ti....	47.0997	48.
Iridium, Ir......	192.6510	192.7	Tungsten, W.....	183.6100	183 6
Iron. Fe.........	55.9130	55.9	Uranium, U	238.4820	238.5
Lanthanum La....	138.5260	138.5	Vanadium, Va....	51.2560	51 3
Lead, Pb........	206.4710	206.5	Ytterbium, Yb ..	172.7610	172.8
Lithium, Li.......	7.0073	7.	Yttrium, Y.......	89.8160	89.8
Magnesium, Mg..	23.9590	24.	Zinc, Zn.........	64.9045	64.9
Manganese, Mn...	53.9060	53.9	Zirconium, Zr....	89.3670	89 4
Mercury, Hg.....	199 7120	199.7			
Molybdenum, Mo	95.5270	95.5			

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* Thorpe, T. E., *Chemical News*, 48 ; 251.

IMPURITIES IN PHOTOGRAPHIC CHEMICALS AND TESTS FOR THEM.

Substance.	Impurities Possibly Present.	Tests.
Ammonia	Carbonic Acid.	Renders lime-water milky.
	Dissolved solid matter	Residue left on evaporation.
	Chlorides.	After acidulating with nitric acid, it gives a precipitate with silver nitrate, which, after washing, is readily soluble in ammonia, and re-precipitated by nitric acid.
	Sulphates.	After acidulating with nitric acid, it gives a precipitate with barium nitrate.
	Lime.	A white precipitate with oxalate of ammonium.
	Lead is often present, derived from the action upon flint glass bottles.	Black precipitate with sulphuretted hydrogen.
Nitric Acid	Traces of sulphuric acid.	After dilution it gives a precipitate with barium nitrate.
	Chlorides.	After dilution it gives a precipitate with silver nitrate.
	Peroxide of nitrogen.	The acid is yellow.
	Iodine may be present if the acid be prepared from sodium nitrate.	After dilution and cooling it gives a blue color with starch paste or mucilage.
Hydrochloric Acid	Free chlorine.	Liberates iodine from solution of potassium iodide. See also chlorides, nitric acid.
	Sulphuric acid.	As above for nitric acid.
	Perchloride of iron.	Yellow color. Brown precipitate with ammonia added till it smells slightly.
Hydrochloric Acid	Arsenic.	Marsh's test.
	Some yellow samples contain no iron, but an organic salt, and give an alkaline ash on ignition of the residue after evaporation.	Reinsh's test; a small piece of copper foil becomes coated on boiling in dilute acid.
Sulphuric Acid	Bisulphate of potassium.	Residue on evaporation.
	Sulphate of lead.	Milkiness on dilution.
		May be completely freed from lead by diluting with three or four times as much water, and allowing to settle.
	When sold as pure, it invariably contains a trace of iron. Common acid is also liable to contain arsenic, selenium, thallium, and many other substances.	No easy test can be given, as the substances are so numerous; some of them volatile, and most require separation from the acid before detection.
	Organic matter, as a piece of straw in a carboy of acid.	Gives a brown color to the acid.
Acetic Acid	Water.	Does not solidify when cooled to 17° C, (53° F.)
	Sulphurous and hydrochloric acids.	White precipitate with silver nitrate.
	Aldehyde, or volatile tarry matter.	Blackens in the light after adding silver nitrate.
	Organic sulphuric acid.	Smell of garlic.
Citric Acid	Tartaric acid.	Strong solution of potassium acetate added to a strong solution of the acid will deposit white crystalline bitartrate.
Pyrogallic Acid	Metagallic acid.	Black residue insoluble in water.
Silver Nitrate	Free nitric acid.	Reddens litmus paper (neutral silver nitrate does not affect litmus).
Potassium Carbonate	Chlorides and sulphates.	Same as for ammonia.
Potassium Iodide	Potassium carbonate.	A strong solution is alkaline to test paper.
	Sulphates and chlorides.	Same as for ammonia.
	Potassium iodate.	A pretty strong solution becomes yellow from liberation of iodine on addition of dilute sulphuric acid, or better, a strong solution of citric acid.

IMPURITIES IN PHOTOGRAPHIC CHEMICALS AND TESTS FOR THEM.—*Continued.*

SUBSTANCE.	IMPURITIES POSSIBLY PRESENT.	TEST.
Potassium Bromide	Similar to potassium iodide.	See potassium iodide.
Sodium Carbonate	Chlorides and sulphates.	Same as for ammonia.
Sodium Chloride	Chloride of calcium. Chloride of magnesium.	Oxalate of ammonium (after addition of a little acetic acid) gives a milkiness or precipitate, indicating calcium; filter this out, and add ammonia, chloride of ammonium, and phosphate of sodium (clear solutions). A precipitate indicates magnesium. Both the above cause dampness in wet weather.
	Sodium sulphate.	As for sulphates in ammonia.
Potassium Cyanide Potassium Hydrate	Potassium carbonate nearly always present.	Effervescence with dilute acids, giving off a gas carbonic anhydride, which renders lime water turbid.
Kaolin	Chalk.	Effervescence with dilute acids.
Water	Sulphates and chlorides.	Same as for ammonia.
	Calcium carbonate, temporary hardness.	Deposited by boiling.
	Ammonia, almost always present in distilled and rain water.	Test as for calcium chloride, see sodium chloride. Brown coloration, or precipitate with Nessler's re-agent.
Gelatine	Alum.	Ash, sometimes as much as 10 per cent.
	Fatty matter.	Separated by precipitation with alcohol. Dissolved out by ether or benzine, and left as a residue on evaporation of the solvent.
Ammonium Bromide	Potassium bromide, or other non-volatile bodies.	Leaves a residue when heated.
	Ammonium chloride.	Same as for chlorides in ammonia.
Pyrogallic Acid	Powdered glass.	Left behind on solution.
Potassium Iodide	Potassium bromide.	The crystals of bromide are usually more transparent than those of iodide, but no reliance can be placed on this.
Silver Nitrate	Potassium nitrate, sometimes present in the fused sticks, not in the crystals.	Will not yield the full quantity of chloride on precipitation with HCl. Gives a purple color to flame.
Calcium Chloride	Calcium hydrate.	The clear filtered solution made with distilled water is alkaline to test paper, and gives a precipitate on breathing into it through a tube.
Pure (?) Chemicals generally.	Broken glass, bits of straw, wood, paper, &c.	These impurities either float or sink on the solution, and may easily be seen.

G. M. Jones.

TABLE SHOWING COMPARATIVE VALUE OF ALKALINE CARBONATES IN DEVELOPERS.

O G. MASON.

COMMERCIAL NAME.	Chemical Symbol.	Molecular Weight.	The Commercial Salt contains of the pure Salt about	100 parts of 36 per cent Acetic Acid Require for Saturation.	Solubility in Water (approximate).
Soda, Caustic	NaOH	40	80 to 92%	26.66 p'rts of 90% Soda	1 part in 2
Sodium Carbonate, Carbonate of Soda, Sal Soda, Crystals,	$Na_2CO_3.10H_2O$	286	96 to 98%	89.38 " 96% "	1 " 2
The same, anhydrous or in dry powder	Na_2CO_3	106	About 98 to 99%	89.38 of 98 to 99% dry Sal Soda.	1 " 6
Sodium Bicarbonate, Bicarbonate of Soda, "Sesqui-carbonate of Soda,"	$NaHCO_3$	84	98 to 100%	50.91 of 99% Bicarb. Soda.	1 " 12

Equal work is done by 80 parts of Caustic Soda, 286 parts of Sal Soda (crystals), 106 parts of Sal Soda (dry), 168 parts of Bicarbonate of Soda. These quantities must be increased to make up for any impurity contained in the sample being used; for this purpose the usual percentage of impurity given in the above table may be assumed for all ordinary photographical uses.

Potassa (Caustic Potash)	KOH	56	80 to 95%	37.33 parts of 90% Potassa.	1 part in 1
Potassium Carbonate, Carbonate of Potassa, Sal Tartar, Saleratus,	$K_2CO_3.1\frac{1}{2}H_2O$	165	76 to 96% Usually about 81%	51.11 parts of 81% Carb. Potassa.	1 " 1
Potassium, Carbonate, dry	C_2CO_3	140	About 95%	122.74 parts of 95% Carb. Potassa.	1 " 1
Potassium Bicarbonate, Bicarbonate of Potassa,	$KHCO_3$	100	100%	60 parts of 100% Bicarb. Potassa.	1 " 4

Equal work is done by 112 parts Caustic Potassa, 165 parts (about) Carbonate Potassa, 200 parts of Bicarbonate Potassa. These quantities must be increased in proportion to impurities, as noted in case of Soda These two alkalies are interchangeable for doing the same amount of work when *pure*, and when the one named in a given formula can not be obtained the table may assist in choosing a substitute of proper strength and solubility.

Dry or anhydrous Carbonate of Potassium is not usually found in the market.

ELSDEN'S TABLE OF POISONS AND ANTIDOTES.

	Poisons.	Remarks.	Characteristic Symptoms.	Antidote.
Vegetable Acids.	Oxalic Acid. including Potassium Oxalate.	1 dram is the smallest fatal dose known.	Hot, burning sensation in throat and stomach; vomiting, cramps, and numbness.	Chalk, whiting or magnesia, suspended in water. Plaster or mortar can be used in emergency.
Caustic Alkalies.	Ammonia. Potash. Soda.	Vapor of ammonia may cause inflammation of the lungs.	Swelling of tongue, mouth, and fauces; often followed by stricture of the œsophagus.	Vinegar and water.
Metallic Salts.	Mercuric Chloride.	3 grains the smallest known fatal dose.	Acrid, metallic taste, constriction and burning in throat and stomach, followed by nausea and vomiting.	White and yolk of raw eggs with milk. In emergency, flour paste may be used.
	Acetate of Lead.	The sub-acetate is still more poisonous.	Constriction in the throat and at pit of stomach; crampy pains and stiffness of abdomen; blue line round the gums.	Sulphates of soda or magnesia. Emetic of sulphate of zinc.
	Cyanide of Potassium.	*a*. Taken internally, 3 grs. fatal.	Insensibility, slow, gasping respiration, dilated pupils, and spasmodic closure of the jaws.	No certain remedy; cold affusion over the head and neck most efficacious.
		b. Applied to wounds and abrasures of the skin.	Smarting sensation.	Sulphate of iron should be applied immediately.
	Bichromate of Potassium	*a*. Taken internally.	Irritant pain in stomach, and vomiting.	Emetics and magnesia, or chalk.
		b. Applied to slight abrasions of the skin.	Produces troublesome sores and ulcers.	
	Nitrate of Silver.		Powerful irritant.	Common salt to be given immediately, followed by emetics.
Concentrated Mineral Acids.	Nitric Acid.	2 drams have been fatal. Inhalation of the fumes has also been fatal.	Corrosion of windpipe and violent inflammation.	Bicarbonate of soda, or carbonate of magnesia or chalk, plaster of the apartment beaten up in water.
	Hydrochloric Acid.	½ ounce has caused death.		
	Sulphuric Acid.	1 dram has been fatal.		
	Acetic Acid, concentrated, has as powerful an effect as the mineral acids.			
	Iodine.	Variable in its action; 3 grains have been fatal.	Acrid taste, tightness about the throat, vomiting.	Vomiting should be encouraged, and gruel, arrowroot and starch given freely.
	Ether.	When inhaled.	Effects similar to chloroform.	Cold affusion and artificial respiration.
	Pyrogallol.	2 grains sufficient to kill a dog.	Resemble phosphorus poisoning.	No certain remedy. Speedy emetic desirable.

ACKLAND'S TABLES FOR THE SIMPLIFICATION OF EMULSION CALCULATIONS.

No. 1.

	Equivalent weights.	Weight of $AgNO_3$ required to convert one grain of soluble haloid.	Weight of soluble haloid required to convert one grain $AgNO_3$.	Weight of silver haloid produced by one grain of soluble haloid.	Weight of soluble haloid required to produce one grain of silver haloid.	Weight of silver haloid produced from one grain $AgNO_3$.
Ammonium bromide.......	98	1.734	.576	1.918	.521	1.106
Potassium "	119.1	1.427	.700	1.578	.633	
Sodium "	103	1.650	.606	1.825	.548	
Cadmium " com. ..	172	.988	1.012	1.093	.915	
" " anh....	136	1.25	.800	1.382	.723	
Zinc "	112.1	1.509	.663	1.670	.600	
Ammonium chloride.......	53.5	3.177	.315	2.682	.373	.844
Sodium "	58.5	2.906	.344	2.453	.408	
Ammonium iodide.........	145	1.172	.853	1.620	.617	1.382
Potassium "	166.1	1.023	.977	1.415	.707	
Sodium "	150	1.133	.882	1.566	.638	
Cadmium "	183	.929	1.076	1.284	.778	

Table No. 1 presents the actual weights of haloid or silver, as the case may be, required to convert or combine with one grain of another.

In order to make (say) ten ounces of emulsion by a new formula, which, for the sake of showing the working of the table, we will write down as follows :

Bromide of potassium..................................	150	grains.
Iodide of potassium..	10	"
Chloride of ammonium......................................	10	"
Gelatine..	200	"

we want to know how much silver nitrate should be employed in sensitizing this mixture. For this purpose we use the first column, in which we find against each haloid the exact quantity of silver nitrate required to fully decompose one grain. Taking, then, the figures we find in column No. 1 against the three salts in the above formula, and multiplying them by the number of grains of each used, we have the following sum :

Potassium bromide......................	150 × 1.427 = 214	Weight silver nitrate required.
" iodide.......	10 × 1.023 = 10.23	
Chloride of ammonium....................	10 × 3.177 = 31.77	

or the total quantity of silver nitrate required for full conversion, 256.00 grains.

‘UNIFORM SYSTEM” NUMBERS FOR STOPS FROM $\frac{f}{1}$ TO $\frac{f}{100}$.

In the following table Mr. S. A. Warburton has calculated the exposure necessary with every stop from $\frac{f}{1}$ to $\frac{f}{100}$ compared with the unit stop of the “uniform system” of the Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from $\frac{f}{4}$, the intermediate numbers showing the uniform system number for any other aperture.

f	U. S. No.	*f*	U. S. No.	*f*	U. S. No.
1	$\frac{1}{16}$	15	14.06	58	210.25
1¼	.097	16	16	59	217.56
1.414	⅛	17	18.06	60	225.00
1½	.140	18	20.25	61	232.56
1¾	.191	19	22.56	62	240.25
2	¼	20	25.00	63	248.06
2¼	.316	21	27.56	64	256
2½	.390	22	30.25	65	264.06
2.828	½	22.62	32	66	272.25
2¾	.472	23	33.06	67	280.56
3	.562	24	36.00	68	289.00
3¼	.660	25	39.06	69	297.56
3½	.765	26	42.25	70	306.25
3¾	.878	27	45.56	71	315.06
4	1.00	28	49.00	72	324.00
4¼	1.12	29	52.56	73	333.06
4½	1.26	30	56.25	74	342.25
4¾	1.41	31	60.06	75	351.56
5	1.56	32	64	76	361.00
5¼	1.72	33	68.06	77	370.56
5½	1.89	34	72.25	78	380.25
5.656	2	35	76.56	79	390.06
5¾	2.06	36	81.00	80	400.00
6	2.25	37	85.56	81	410.06
6¼	2.44	38	90.25	82	420.25
6½	2.64	39	95.06	83	430.56
6¾	2.84	40	100.00	84	440.00
7	3.06	41	105.06	85	451.56
7¼	3.28	42	110.25	86	462.25
7½	3.51	43	115.56	87	473.06
7¾	3.75	44	121.00	88	484.00
8	4	45	126.56	89	495.06
8¼	4.25	45.25	128	90	506.25
8½	4.51	46	132.25	90.50	512
8¾	4.78	47	138.06	91	517.56
9	5.06	48	144.00	92	529.00
9¼	5.34	49	150.06	93	540.56
9½	5.64	50	156.25	94	552.25
9¾	5.94	51	162.56	95	564.06
10	6.25	52	169.00	96	576.00
11	7.56	53	175.56	97	588.06
11.31	8	54	182.25	98	600.25
12	9.00	55	189.06	99	612.56
13	10.56	56	196.00	100	625.00
14	12.25	57	203.06		

EQUATIONS RELATING TO FOCI.

The following simple optical formulas and calculations, worked out by Mr. J. A. C. Branfill, will prove useful in many branches of photography, especially where several lenses of varying foci are in constant use for a variety of purposes:

p = Principal focus.
F = Greater conjugate focus.
f = Lesser conjugate focus.
r = Ratio of any dimension in original to the same dimensions in copy (in case of reduction), or *vice versa* (in case of enlargement).
a = Diameter of aperture to lens.
x = Exposure required, assuming that $x = 1$ when $a = \frac{p}{4}$.

$$p = \frac{r(F+f)}{(r+1)^2}$$

$$f = p\left(\frac{1+r}{r}\right) = \frac{F+f}{r+1}$$

$$F = p(r+1) = rf$$

$$F+f = p \times \frac{(r+1)^2}{r} = p\left(2+r+\frac{1}{r}\right)$$

$$r = \frac{F-p}{p} = \frac{p}{f-p} = \frac{F}{f}$$

$$x = \frac{f^2}{16a^2}$$

N. B.—For ordinary landscape work, where r is greater than 20, x may be taken as $\frac{p^2}{16a^2}$

NOTE.—In case the above may not be clear to some photographers, the following rules may be better understood:

To find the principal focus of a lens (p), focus a near object in the camera, and measure the distance between it and the ground glass ($F+f$); next find the proportion which any dimension in the object bears to the same dimension on the ground glass (r). Thus, if the original dimension be four times as large as its reproduction, we say that r equals (=) 4. Multiply $F+f$ by r, and divide the product by the square of a number greater by one than r $(r+1)^2$. This rule was lately published by Mr. Debenham.

To find the lesser conjugate focus (f) (if p and r are known), multiply p by the sum of $r+1$ and divide the product by r. Or divide $F+f$ by $r+1$.

To find the greater conjugate focus (F) multiply p by $r+1$. Or multiply f by r.

To find $F+f$ (the distance which the ground glass should be from the object to be copied in order to get a given value for r) multiply p by the sum of $r+\frac{1}{r}+2$.

To find r divide $F-p$ (the difference between F and p) by p. Or divide p by $f-p$. Or divide F by f.

To find x divide the square of f by 16 times the square of a (the diameter of aperture to lens).

For example Focus an object which is five inches high, so that it is one inch high on the ground glass; thus we know that $r = 5$. Next measure the distance between the object and the ground glass ($F+f$), which is found to be 45 inches.

Then $p = 45 \times$ (multiplied by) $5 \div$ (divided by) $6 \times 6 = 6\frac{1}{4}$ inches.
$f = 6\frac{1}{4} \times 6 \div 5 = 7\frac{1}{2}$ inches. Or $f = 45 \div 6 = 7\frac{1}{2}$ inches.
$F = 6\frac{1}{4} \times 6 = 37\frac{1}{2}$ inches. Or $F = 7\frac{1}{2} \times 5 = 37\frac{1}{2}$ inches.
$F+f = 6\frac{1}{4} \times (5+\frac{1}{5}+2) = 6\frac{1}{4} \times 7\frac{1}{5} = 45$ inches.
$r = (37\frac{1}{2} - 6\frac{1}{4}) \div 6\frac{1}{4} = 5$. Or $r = 6\frac{1}{4} \div (7\frac{1}{2} - 6\frac{1}{4}) = 5$.

And x (the exposure required) will be $7\frac{1}{2} \times 8\frac{1}{2} \div (16 \times \frac{9}{16}) = 6\frac{1}{2}$; that is, the exposure will be $6\frac{1}{4}$ times as much as the exposure required with an aperture whose diameter equals $p \div 4$, assuming the aperture (a) to be $\frac{3}{4}$ inch diameter.

TABLE SHOWING DISPLACEMENT ON GROUND GLASS OF OBJECTS IN MOTION.

By HENRY L. TOLMAN.

[Republished, with corrections, from the *Photographic Times.*]

LENS 6 IN EQUIV. FOCUS, GROUND GLASS AT PRINCIPAL FOCUS OF LENS.

Miles per Hour.	Feet per Second.	Distance on Ground Glass, in inches, with Object 30 Feet away.	Same with Object 60 Feet away.	Same with Object 120 Feet away.
1	1½	.29	.15	.073
2	3	.59	.29	.147
3	4½	.88	.44	.220
4	6	1.17	.59	.293
5	7½	1.47	.73	.367
6	9	1.76	.88	.440
7	10½	2.05	1·03	.513
8	12	2 35	1.17	.587
9	13	2.64	1.32	.690
10	14½	2.93	1.47	.733
11	16	3.23	1.61	.807
12	17½	3.52	1.76	.880
13	19	3.21	1.90	.953
14	20½	4.11	2.06	1.027
15	22	4.40	2.20	1.100
20	29	5.87	2.93	1.467
25	37	7.33	3.67	1.833
30	44	8.80	4.40	2.200
35	51	10.27	5.13	2.567
40	59	11.73	5.97	2·933
45	66	13.20	6.60	3.300
50	73	14.67	7.33	3.667
55	80	16.13	8.06	4.033
60	88	17.60	8.80	4.400
75	110	22.00	11.00	5.500
100	147	29.33	14.67	7.333
125	183	36.67	18.33	9.167
150	220	44.00	22.00	11.000

TABLE FOR ENLARGEMENT AND REDUCTION

Computed for Centimeters or Inches.

Equivalent Focus of the Lens.	Distances of the Object and the Ground Glass Screen from the Center of the Objective.																								
	1 *t.*	2 *t.*	3 *t.*	4 *t.*	5 *t.*	6 *t.*	7 *t.*	8 *t.*	9 *t.*	10 *t.*	11 *t.*	12 *t.*	13 *t.*	14 *t.*	15 *t.*	16 *t.*	17 *t.*	18 *t.*	19 *t.*	20 *t.*	21 *t.*	22 *t.*	23 *t.*	24 *t.*	25 *t.*
5..	10 10	15 7.5	20 6.7	25 8.3	30 6	35 5.8	40 5.7	45 5.6	50 5.6	55 5.5	60 5.4	65 5.4	70 5.4	75 5.4	80 5.3	85 5.3	90 5.3	95 5.3	100 5.3	105 5.3	110 5.2	115 5.2	120 5.2	125 5.2	130 5.2
6..	12 12	18 9	24 8	30 7.5	36 7.2	42 7	48 6.9	54 6.8	60 6.7	66 6.6	72 6.5	78 6.5	84 6.4	90 6.4	92 6.4	102 6.4	108 6.4	114 6.3	120 6.3	126 6.3	132 6.3	138 6.3	144 6.3	150 6.3	156 6.2
7..	14 14	21 10.5	28 9.3	35 8.8	42 8.4	49 8.2	56 8	63 7.9	70 7.8	77 7.7	84 7.6	91 7.6	98 7.5	105 7.5	112 7.5	119 7.4	126 7.4	133 7.4	140 7.4	147 7.4	154 7.3	161 7.3	168 7.3	175 7.3	182 7.3
8..	16 16	24 12	32 10.7	40 10	48 9.6	56 9.3	64 9.1	72 9	80 8.8	88 8.8	96 8.7	104 8.7	112 8.6	120 8.6	128 8.5	136 8.5	144 8.5	152 8.4	160 8.4	168 8.4	176 8.4	184 8.4	192 8.3	200 8.3	208 8.3
9..	18 18	27 13.5	36 12	45 11.3	54 10.8	63 10.5	72 10.3	81 10.1	90 9.9	99 9.9	108 9.8	117 9.8	126 9.7	135 9.6	144 9.6	153 9.6	162 9.5	171 9.5	180 9.5	189 9.5	198 9.4	207 9.4	216 9.4	225 9.4	234 9.4
10..	20 20	30 15	40 13.3	50 12.5	60 12	70 11.7	80 11.4	90 11.3	100 11.1	110 11	120 10.9	130 10.8	140 10.8	150 10.7	160 10.7	170 10.6	180 10.6	190 10.6	200 10.5	210 10.5	220 10.5	230 10.5	240 10.4	250 10.4	260 10.4
11..	22 22	33 16.5	44 14.7	55 13.8	66 13.2	77 12.8	88 12.6	99 12.4	110 12.2	121 12.1	132 12	143 11.9	154 11.8	165 11.8	176 11.7	187 11.7	198 11.6	209 11.6	220 11.6	231 11.6	242 11.5	253 11.5	264 11.5	275 11.5	286 11.4
12..	24 24	36 18	48 16	60 15	72 14.4	84 14	96 13.7	108 13.5	120 13.3	132 13.2	144 13.1	156 13	168 12.9	180 12.9	192 12.8	204 12.7	216 12.7	228 12.7	240 12.6	252 12.6	264 12.6	276 12.5	288 12.5	300 12.5	312 12.5
13..	26 26	39 19.5	52 17.3	65 16.3	78 15.6	91 15.1	104 14.9	117 14.6	130 14.4	143 14.3	156 14.2	169 14.1	182 14	195 13.9	208 13.9	221 13.8	234 13.8	247 13.7	260 13.7	273 13.7	286 13.6	299 13.6	312 13.6	325 13.5	338 13.5
14..	28 28	42 21	56 18.7	70 17.5	84 16.8	98 16.3	112 16	126 15.8	140 15.6	154 15.4	168 15.3	182 15.2	196 15.1	210 15	224 14.9	238 14.9	252 14.8	266 14.8	280 14.7	294 14.7	308 14.7	322 14.6	336 14.6	350 14.6	364 14.6
15..	30 30	45 22.5	60 20	75 18.8	90 18	105 17.5	120 17.1	135 16.9	150 16.7	165 16.5	180 16.4	195 16.3	210 16.2	225 16.1	240 16	255 15.9	270 15.9	285 15.8	300 15.8	315 15.8	330 15.7	345 15.7	360 15.7	375 15.6	390 15.6

16..	32 32	48 24	64 21.3	80 20	96 19.2	112 18.7	128 18.3	144 18	160 17.8	176 17.6	192 17.5	208 17.3	224 17 2	240 17.1	256 17.1	272 16.9	288 16.9	304 16.9	320 16.8	336 16.8	352 16.8	368 16.7	384 16.7	400 16.7	416 16.6
17..	34 34	51 25.5	68 22.7	85 21.3	102 20.4	119 19.8	136 19.4	153 19.1	170 18.9	187 18.7	204 18.5	221 18.4	238 18.3	255 18.2	272 18.1	289 18.1	306 18	323 17.9	340 17.9	357 17.9	374 17.8	391 17.8	408 17.7	425 17.7	442 17.7
18..	36 36	54 27	72 24	90 22.5	108 21.6	126 21	144 20.6	162 20.3	180 20	198 19.8	216 19.6	234 19.5	252 19.4	270 19.3	288 19.2	306 19.1	324 19.1	342 19	360 18.9	378 18.9	396 18.8	414 18.8	432 18.8	450 18.8	468 18.7
19..	38 38	57 28.5	76 25.3	95 23.8	114 22.8	133 22.2	152 21.7	171 21.4	190 21.1	209 20.9	228 20.7	247 20.6	266 20.5	285 20.4	304 20.3	323 20.2	342 20.1	361 20.1	380 20	399 20	418 19.9	437 19.8	456 19.8	475 19.8	494 19.8
20..	40 40	60 30	80 26.6	100 25	120 24	140 23.3	160 22.9	180 22.5	200 22.2	220 22	240 21.8	260 21.7	280 21.5	300 21.4	320 21.3	340 21.3	360 21.2	380 21.2	400 21.1	420 21	440 21	460 20.9	480 20.9	500 20.8	520 20.8
21..	42 42	63 31.5	84 28	105 26.3	126 25.2	147 24.5	168 24	189 23.7	210 23.3	231 23.1	252 22.9	273 22.8	294 22.6	315 22.5	336 22.4	357 22.3	378 22.2	399 22.2	420 22.1	441 22.1	462 22	483 21.9	504 21.9	525 21.9	546 21.8
22..	44 44	66 33	88 29.3	110 27.5	132 26.4	154 25.7	176 25.1	198 24.8	220 24.4	242 24.2	264 24	286 23.8	308 23.7	330 23.6	352 23.5	374 23.4	396 23.2	418 23.2	440 23.2	462 23.1	484 23	506 23	528 23	550 22.9	572 22.1
23..	46 46	69 34.5	92 30.7	115 28.8	138 27.6	161 26.7	184 26.3	207 25.9	230 25.6	253 25.3	276 25.1	299 24.9	322 24.8	345 24.6	368 24.5	391 24.4	414 24 3	437 24.3	460 24.2	483 24.2	506 24.1	529 24	552 24	575 24	598 23 9
24..	48 48	72 36	96 32	120 30	144 28.8	168 28	192 27.4	216 27	240 26.7	264 26.4	288 26.2	312 26	336 25.8	360 25.7	384 25.6	408 25.5	432 25.4	456 25.3	480 25.3	504 25.2	528 25.1	552 25.1	576 25	600 25	624 25
25..	50 50	75 37.5	100 33.3	125 31.3	150 30	175 29.2	200 28.6	225 28.1	250 27.8	275 27.5	300 27.3	325 27.1	350 26.9	375 26.8	400 26.7	425 26.6	450 26.5	475 26.4	500 26.3	525 26.3	550 26.2	575 26.1	600 26.1	625 26	650 26

The use of the above table will best be explained by illustrations :

To enlarge six times with a lens of 15 centimeters (or inches) focal length. We find in the table under 6 *t.* and opposite the figures $\frac{105}{17.5}$, hence the object must be 17.5, and the screen 105 centimeters (or inches) from the centre of the lens.

To reduce eight times with a lens of 19 centimeters (or inches) focus, the object must be 171 and the screen 21.4 centimeters (or inches) from centre of lens.

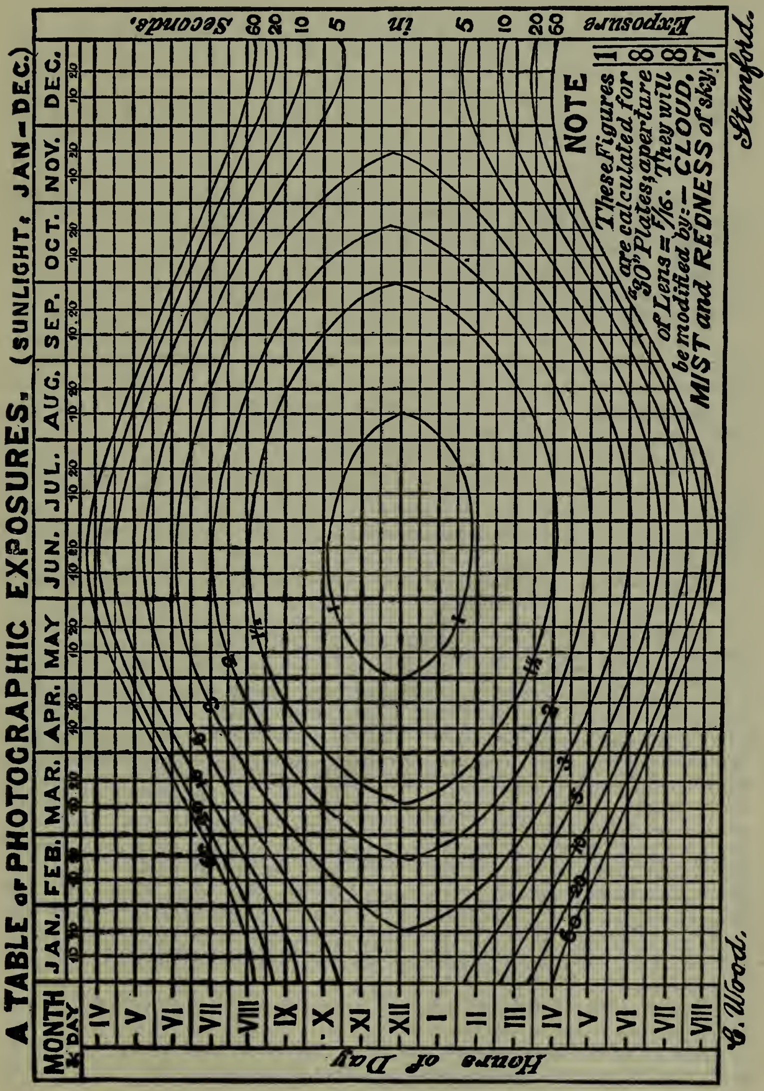
The table can be formulated thus : Where p = focal length of lens, a = distance from ground glass to centre of lens and b = distance from object to centre of lens, then $\frac{1}{a} + \frac{1}{b} = \frac{1}{p}$

MR. W. K. BURTON'S TABLE OF COMPARATIVE EXPOSURES.

Apertures Calculated on the Standard System of the Photographic Society.	Sea and Sky.	Open Landscape.	Landscape with heavy foliage in foreground.	Under Trees, up to		Fairly Lighted Interiors.		Badly Lighted Interiors, up to		Portraits in bright diffused Light out of doors.	Portraits in good Studio Light.		Portraits in Ordinary Room.	
				mins.	secs.	mins.	secs.	hrs.	mins.		mins.	secs.	mins.	secs.
No. 1, or $\frac{f}{4}$	$\frac{1}{160}$ sec.	$\frac{1}{50}$ sec.	$\frac{1}{8}$ sec.	0	10	0	10	0	2	$\frac{1}{6}$ sec.	0	1	0	4
No. 2, or $\frac{f}{5.657}$	$\frac{1}{80}$ sec.	$\frac{1}{25}$ sec.	$\frac{1}{4}$ sec.	0	20	0	20	0	4	$\frac{1}{3}$ sec.	0	2	0	8
No. 4, or $\frac{f}{8}$	$\frac{1}{40}$ sec.	$\frac{1}{12}$ sec.	$\frac{1}{2}$ sec.	0	40	0	40	0	8	$\frac{2}{3}$ sec.	0	4	0	16
No. 8, or $\frac{f}{11.314}$	$\frac{1}{20}$ sec.	$\frac{1}{6}$ sec.	1 sec.	1	20	1	20	0	16	$1\frac{1}{3}$ sec.	0	8	0	32
No. 16, or $\frac{f}{16}$	$\frac{1}{10}$ sec.	$\frac{1}{3}$ sec.	2 secs.	2	40	2	40	0	32	$2\frac{2}{3}$ secs.	0	16	1	4
No. 32, or $\frac{f}{22.627}$	$\frac{1}{5}$ sec.	$\frac{2}{3}$ sec.	4 secs.	5	20	5	20	1	4	$5\frac{1}{3}$ secs.	0	32	2	8
No. 64, or $\frac{f}{32}$	$\frac{2}{5}$ sec.	$1\frac{1}{3}$ sec.	8 secs.	10	40	10	40	2	8	$10\frac{2}{3}$ secs.	1	4	4	16
No. 128, or $\frac{f}{45.255}$	$\frac{4}{5}$ sec.	$2\frac{2}{3}$ secs.	16 secs.	21	20	21	20	4	16	21 secs.	2	8	8	32
No. 256, or $\frac{f}{64}$	$1\frac{3}{5}$ sec.	$5\frac{1}{3}$ secs.	32 secs.	42	40	42	40	8	32	42 secs.	4	16	17	4

GRAPHIC TABLE OF RELATIVE EXPOSURES.

FROM "*Photo. News.*"



WEATHER INDICATIONS.

TABLE SHOWING THE NUMBER OF CLOUDY, CLEAR, AND RAINY DAYS IN EACH MONTH.

The table of cloudy, clear, and rainy days shows the average indications for lower New England and New York and its neighborhood.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Clear	11.0	9.8	11.0	10.3	9.6	10.0	11.2	10.8	12.7	12.0	10.3	10.0
Cloudy	11.0	9.9	10.8	10.4	11.5	11.0	11.1	10.3	10.4	12.0	11.9	11.7
Rain or Snow	9.2	8.2	9.1	9.2	9.8	8.8	8.4	8.1	6.8	6.8	7.8	0.2

Sunset Colors.—A gray, lowering sunset, or one where the sky is green or yellowish green, indicates rain. A red sunrise, with clouds lowering later in the morning, also indicates rain.

Halo (Sun Dogs).—By halo we mean the large circles, or parts of circles, about the sun or moon. A halo occurring after fine weather indicates a storm.

Corona.—By this term we mean the small colored circles frequently seen around the sun or moon. A corona growing smaller indicates rain; growing larger, fair weather.

Rainbows.—A morning rainbow is regarded as a sign of rain; an evening rainbow, of fair weather.

Sky Color.—A deep blue color of the sky, even when seen through clouds, indicates fair weather; a growing whiteness, an approaching storm.

Fog.—Fogs indicate settled weather. A morning fog usually breaks away before noon.

Visibility.—Unusual clearness of the atmosphere, unusual brightness or twinkling of the stars indicates rain.

Clouds.—In observing clouds, we observe their kinds, motions, and outlines. The clouds frequently called "mare's tails" we term Cirri. They are marked by their light texture, fibrous and sundered as in the "mare's tail," or interlacing, as in the far-spreading white cloud, which produce the halo. Small, regularly formed groups of these clouds are frequently seen in fair and settled weather. The Cirri are also the clouds on the forepart of the storm. In this case they are usually more abundant, their outline is very ragged, and they gradually blend into a white, far-reaching cloud bank. The cloud well known as "cotton bales," or "thunder heads," we term cumulus. When they appear during the heat of the day and pass away in the evening, continued fair weather may be expected. When they increase with rapidity, sink into the lower part of the atmosphere, and remain as the evening approaches, rain is at hand. If loose patches appear thrown out from their surfaces, showers may be expected. The clouds usually seen after nightfall, lying in one horizontal plane, and not of great extent, are attendant on fine weather. Small, black, inky clouds and dark scud indicate rain.

Frost.—The first frost and last frost are usually preceded by a temperature very much above the mean.

The table of cloudy, clear, and rainy days, and the weather indications, are from the meteorological tables in "The Connecticut Almanac," prepared by Prof. A. W. Phillips, of Yale College.

U. S. PATENT OFFICE PROCEDURE.

PATENTS are issued in the name of the United States, and under the seal of the Patent Office to any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country. before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned ; and by any person who, by his own industry, genius, efforts, and expense, has invented and produced any new and original design for a manufacture, bust, statue, alto-relievo, or bas relief ; any new and original design for the printing of woolen, silk, cotton, or other fabrics ; any new and original impression, ornament, pattern, print, or picture to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture ; or any new, useful, and original shape or configuration of any article of manufacture, the same not having been known nor used by others before his invention or production thereof, nor patented nor described in any printed publication, upon payment of the fees required by law and other due proceedings had.

Every patent contains a grant to the patentee, his heirs or assigns, for the term of seventeen years, of the exclusive right to make, use, and vend the invention or discovery throughout the United States and the Territories, referring to the specification for the particulars thereof,

If it appear that the inventor, at the time of making his application, believed himself to be the first inventor or discoverer, a patent will not be refused on account of the invention or discovery, or any part thereof, having been known or used in any foreign country before his invention or discovery thereof, if it had not been before patented or described in any printed publication.

Joint inventors are entitled to a joint patent ; neither can claim one separately, Independent inventors of distinct and independent improvements in the same machine can not obtain a joint patent for their separate inventions ; nor does the fact that one furnishes the capital and another makes the invention entitle them to make application as joint inventors ; but in such case they may become joint patentees.

The receipt of letters patent from a foreign government will not prevent the inventor from obtaining a patent in the United States, unless the invention shall have been introduced into public use into the United States more than two years prior to the application. But every patent granted for an invention which has been previously patented by the same inventor in a foreign country will be so limited as to expire at the same time with the foreign patent, or, if there be more than one, at the same time with the one having the shortest unexpired term, but in no case will it be in force more than seventeen years.

APPLICATIONS.

Application for a patent must be made in writing to the Commissioner of Patents. The applicant must also file in the Patent Office a written description of the same, and of the manner and process of making, constructing, compounding. and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound, and use the same ; and in case of a machine, he must explain the principle thereof, and the best mode in which he has contemplated applying that principle, so as so distinguish it from other inventions, and particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery. The specification and claim must be signed by the inventor and attested by two witnesses.

When the nature of the case admits of drawings, the applicant must furnish one copy signed by the inventor or his attorney in fact, and attested by two witnesses, to be filed in the Patent Office. In all cases which admit of representation by model, the applicant, if required by the commissioner, shall furnish a model of convenient size to exhibit advantageously the several parts of his invention or discovery.

The applicant shall make oath that he verily believes himself to be the original and first inventor or discoverer of the art, machine, manufacture, composition, or improvement for which he solicits a patent; that he does not know and does not believe the same was ever before known or used, and shall state of what country he is a citizen. Such oath may be made before any person within the United States authorized by law to administer oaths, or, when the applicant resides in a foreign country, before any minister, charge d'affaires, consul, or commercial agent, holding commission under the Government of the United States, or before any notary public of the foreign country in which the applicant may be.

On the filing of such application and the payment of the fee required by law, if on such examination, it appears that the claimant is justly entitled to a patent under the law, and that the same is sufficiently useful and important, the commissioner will issue a patent therefor.

ASSIGNMENTS.

Every patent or any interest therein shall be assignable in law by an instrument in writing; and the patentee or his assigns or legal representatives may, in like manner, grant and convey an exclusive right under his patent to the whole or any specified part of the United States.

REISSUES.

A reissue is granted to the original patentee, his legal representatives, or the assignees of the entire interest when, by reason of a defective or insufficient specification, or by reason of the patentee claiming as his invention or discovery more than he had a right to claim as new, the original patent is in operative or invalid, provided the error has arisen from inadvertence, accident, or mistake, and without any fraudulent or deceptive intention. In the cases of patents issued and assigned prior to July 8th, 1870, the applications for reissue may be made by the assignees; but in the cases of patents issued or assigned since that date, the applications must be made and the specifications sworn to by the inventors, if they be living.

CAVEATS.

A caveat under the patent law, is a notice given to the office of the caveator's claim as inventor, in order to prevent the grant of a patent to another for the same alleged invention upon an application filed during the life of the caveat without notice to the caveator.

Any citizen of the United States who has made a new invention or discovery, and desires further time to mature the same, may, on payment of a fee of ten dollars, file in the Patent Office a caveat setting forth the object and the distinguishing characteristics of the invention, and praying protection of his right until he shall have matured his invention. Such caveat shall be filed in the confidential archives of the office and preserved in secrecy, and shall be operative for the term of one year from the filing thereof.

An alien has the same privilege, if he has resided in the United States one year next preceding the filing of his caveat, and has made oath of his intention to become a citizen.

The caveat must comprise a specification, oath, and, when the nature of the case admits of it, a drawing, and, like the application, must be limited to a single invention or improvement.

FEES.

Fees must be paid in advance, and are as follows: On filing each original application for a patent, $15. On issuing each original patent, $20. In design cases: For three years and six months, $10; for seven years, $15; for fourteen years, $30. On filing each caveat, $10. On every application for the reissue of a patent, $30. On filing each disclaimer, $10. For certified copies of patents and other papers, including certified printed copies, ten cents per hundred words. For recording every assignment, agreement, power of attorney, or other paper, of three hundred words or under, $1; of over three hundred and under one thousand words, $2; of over one thousand words, $3. For copies of drawings, the reasonable cost of making them.

COPYRIGHT LAW OF THE UNITED STATES.

ANY citizen of the United States, or resident therein, who is the author inventor, designer, or proprietor of any book, map, chart, dramatic or musical composition, engraving, cut, PRINT, OR PHOTOGRAPH, OR NEGATIVE THEREOF, or of a painting, drawing, chromo, statue, statuary, and of models or designs intended to be perfected as works of the fine arts, and the executors, administrators, or assigns of any such person, may secure to himself the sole liberty of printing, publishing, completing, copying, and vending the same, and, if a dramatic composition, of publicly performing or representing it, or causing it to be performed or represented by others.

Every applicant for a copyright must state distinctly the name and residence of the claimant, and whether right is claimed as author, designer, or proprietor. No affidavit or formal application is required.

A *printed* copy of the title (besides the two copies to be deposited after publication) of the book, map, chart, dramatic or musical composition, engraving, cut, print, or photograph, or a *description* of the painting, drawing, chromo, statue, statuary, or model or design for a work of the fine arts, for which copyright is desired, must be sent by mail or otherwise, *prepaid*, addressed "LIBRARIAN OF CONGRESS, WASHINGTON, D. C." This must be done before publication of the book or other article.

The *printed title* required may be a copy of the title-page of such publications as have title-pages. In other cases, the title must be printed expressly for copyright entry, with name of claimant of copyright. The style of type is immaterial, and the print of a type-writer will be accepted. But a separate title is required for each entry, and *each* title must be printed on paper as large as commercial note. The title of a *periodical* must include the date and number.

FEES.

The legal fee for *recording* each copyright claim is 50 cents, and for a *copy* of this record (or certificate of copyright) an additional fee of 50 cents is required. Certificates covering more than one entry are not issued.

Within ten days after publication of each book or other article, two complete copies of the best edition issued must be sent, to perfect the copyright, with the address "LIBRARIAN OF CONGRESS, WASHINGTON, D. C." The postage must be prepaid, or else the publications inclosed in parcels covered by printed Penalty Labels, furnished by the Librarian, in which case they will come FREE by mail, without limit of weight, according to rulings of the Post Office Department. Without the deposit of copies above required the copyright is void, and a penalty of $25 is incurred. No copy is required to be deposited elsewhere.

NOTICE OF COPYRIGHT.

A copy of the record (or duplicate certificate) of any copyright entry will be furnished, under seal, at the rate of 50 cents each.

No copyright is valid unless notice is given by inserting in every copy published, on the title page or the page following, if it be a book ; or, if a map, chart, musical composition, print, cut, engraving, photograph, painting, drawing, chromo, statue, statuary, or model or design intended to be perfected as a work of the fine arts, by inscribing upon some portion thereof, or on the substance on which the same is mounted, the following words, viz. : "*Entered according to act of Congress, in the year* ——, *by* ——, *in the office of the Librarian of Congress, at Washington*," or, at the option of the person entering the copyright, the words : "*Copyright*, 18—, *by* ——."

The law imposes a penalty of $100 upon any person who has not obtained copyright who shall insert the notice "*Entered according to act of Congress*," or "*Copyright*," etc., or words of the same import, in or upon any book or other article.

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Any author may reserve the right to translate or dramatize his own work. In this case notice should be given by printing the words "*Right of translation reserved*," or "*All rights reserved*," below the notice of copyright entry, and notifying the Librarian of Congress of such reservation, to be entered upon the record.

Since the phrase *all rights reserved* refers exclusively to the author's right to dramatize or to translate, it has no bearing upon any publications except original works, and will not be entered upon the record in other cases.

DURATION OF COPYRIGHT.

The original term of copyright runs for twenty-eight years. *Within six months before* the end of that time, the author or designer, or his widow or children, may secure a renewal for the further term of fourteen years, making forty-two years in all. Applications for renewal must be accompanied by explicit statement of ownership, in the case of the author, or of relationship, in the case of his heirs, and must state definitely the date and place of entry of the original copyright. Advertisement of renewal is to be made within two months of date of renewal certificate, in some newspaper, for four weeks.

ASSIGNMENTS.

A copyright is assignable in law by any instrument of writing, but such assignment must be recorded in the office of the Librarian of Congress within sixty days from its date. The fee for this record and certificate is one dollar, and for a certified copy of any record of assignment one dollar.

SERIALS OR SEPARATE PUBLICATIONS.

In the case of books published in more than one volume, or of periodicals published in numbers, or of engravings, photographs, or other articles published with variations, a copyright is to be entered for each volume or part of a book, or number of a periodical, or variety, as to style, title, or inscription of any other article. But a book published serially in a periodical under the same general title, requires only one entry. To *complete* the copyright on such a work, two copies of each serial part, as well as of the complete work (if published separately), must be deposited.

WORKS OF ART.

To secure a copyright for a painting, statue, or model or design intended to be perfected as a work of the fine arts, so as to prevent infringement by copying, engraving, or vending such design, a definite description must accompany the application for copyright, and a photograph of the same, at least as large as "cabinet size," should be mailed to the Librarian of Congress within ten days from the completion of the work or design.

Copyrights can not be granted upon trade-marks, nor upon mere names of companies or articles, nor upon prints or labels intended to be used with any article of manufacture. If protection for such names or labels is desired, application must be made to the Patent Office, where they are registered at a fee of $6 for labels and $25 for trade-marks.

RECORD OF PHOTOGRAPHIC PATENTS.—1887.

ISSUED BY THE UNITED STATES PATENT OFFICE, WITH NAMES OF PATENTEES.

5,217.—(Label). Blakelock's Retouching Varnish.
RALPH A. BLAKELOCK, New York, N.Y.
353,763.—Album Stand.
FREDRIC SEIPELT. New York City.
353,765.—Photographic Print Washer.
WILLIAM G. ENTREKIN, Philadelphia, Pa.
354,211.—Placque Easel.
STEPHEN R. PAY, Peoria, Ill.
354,259.—Photographer's Chair.
JAMES H. SMITH, Chicago, Ill.
354,344.—Apparatus for Washing Photographic Plates.
HENRY CLAY PRICE, New York City.
354,650.—Method of Purifying Water.
W. J. MORRISON and JOHN D. WHARTON, Nashville, Tenn.
354,824.—Joint for Frames of Pictures and Other Frames.
JACOB APOLL, Chicago, Ill.
354,856.—Camera Stand.
JOHN J. HIGGINS, New York City.
355,056.—Photographers' Plate-holder.
NELSON S. BOWDISH, Skaneateles, N. Y.
355,084.—Photographic Apparatus.
DAVID HOUSTON, Hunter, Dakota.
355,413.—Camera Stand.
GEORGE H. READ, Brooklyn, N. Y.
356,399.—Photograph Burnisher.
WARREN H. BOLES, Syracuse, N. Y.
356,567. Adjustable Plate-holder for Photographic Cameras.
ERASTUS B. BARKER, New York City.
356,577.—Retouching Table.
CHARLES L. DUNHAM, Rahway, N. J., and GEORGE N. HOFFMAN, New York City.
356,941.—Photographic Camera.
OLIVER HYDE, Vallejo, Cal.
357,114.—Photographic Camera.
DANIEL A. A. BUCK, Chesire, Conn.
357,476.—Funnel.
AUGUSTUS GERSDORFF, Washington, D. C.
357,483.—Apparatus for Coating Photographic Plates.
MATTHEW PARKER ISMAY, Newcastle-on-Tyne, and EDWIN DODDS, of Low Fell, Gateshead, England.
357,746.—Diffraction Camera.
JOHN VANSANT, St. Louis, Mo.

357,752.—Photographic Camera.
W. IRVING ADAMS, Montclair, N. J.
357,886.—Vignette Attachment for Photographic Frames.
LEO F. ADT, Waterbury, Conn.
357,954.—Photographic Burnishing Machine.
WILLIAM G. ENTREKIN, Philadelphia, Pa.
357,984.—Photographic Camera.
MATTHIAS FLAMMANG, Newark, N. J.
358,661.—Albertype Printing Machine.
JOHN T. HAWKINS, Taunton, Mass.
358,816.—Photography.
ARMAND-MUELLER-JACOBS, New York.
358,817.—Photographic Reproduction.
WILLIAM L. IMLAY, Camden, N. J.
358,848.—Apparatus for Manufacturing Sensitive Photographic Films.
GEORGE EASTMAN and WILLIAM H. WALKER, Rochester, N. Y.
358,893.—Photographic Camera Slide.
ALFRED P. SHARP, Dublin, Ireland.
358,942.—Photographic Camera.
HENRY C. PRICE, New York City.
ARMAND-MUELLER-JACOBS, New York.
359,670.—Album.
MICHAEL P. EVANS, Chicago, Ill.
359,715.—Drop Shutter for Cameras.
LOUIS A. DE RIBA, Boston, Mass.
359,725.—Picture Exhibitor.
MARCELLUS JEWETT, Cleveland, O.
359,902.—Aerial Photographic Apparatus.
MATHEW J. STEVENS, Chicago, Ill.
360,855.—Photographer's Chair.
JOHN W. COOPER, Atlanta, Ga.
360,909.—Method of Enamelling Photographs and Other Prints.
JOSEPH P. PHELPS, Muscatine, Iowa.
361,070.—Photographic Print Washer.
JOHN T. LONG, Menomonee, Wis.
361,387.—Photographic Camera.
SIMON WING, Boston, Mass.
361,388.—Plate-holder for Photographic Camera.
SIMON WING, Boston, Mass.
361,672.—Photographic Camera.
WALTER CLARK, New York City.
361,673.—Photographic Camera.
WALTER CLARK, New York City.
361,826.—Folding Top for Camera Stand.
WILLIAM H. LEWIS, Brooklyn.
361,856.—Camera Shutter.
FRED. K. BETTS, New York City.
361,947.—Photographic Shutter.
362,211.—Photographic Shutter.
GEORGE F. GREEN, Kalamazoo, Mich.
362,271.—Photographic Camera.
ROBERT D. GRAY and HENRY E. STAMMERS, New York, N. Y.
362,320.—Zincographic-printing Machine.
JOHN F. SCHERBER, Buffalo, N. Y.
362,390.—Multiplex Photographic Background.
GEORGE W. MORGAN, Aberdeen, County of Aberdeen, Scotland.

362,518.—Photographic Time Shutter.
Edmund Kuhn, Brooklyn, N. Y.
362,599.—Photographic Camera.
Thomas H. Blair, Boston, Mass.
362,663.—Shutter for Photographic Camera.
Wesley E. Roberts, Hartford, Ky.
362,782.—Photographic Developing Cabinet.
Charles R. Quigley, Boston, Mass.
362,974.—Process of Etching Zinc and Other Metal Plates.
Louis W. Kipp, Hoboken, N. J.
362,978.—Photographic Camera.
Joseph Krementz, New Albany, Ind.
363,209.—Photographic Printing Frame.
Giles H. Cheseboro, Toledo, O.
363,429.—Stop Shutter or Diaphragm Light Controller for Photographic Cameras.
George C. Stanley, Ithaca, N. Y.
363,505.—Photographic Developing Tray.
Sherburn W. Burnham, Chicago, Ill.
363,547.—Shutter for Photographic Camera.
William E. Schneider, Washington, D. C.
363,833.—Combined Photographic Camera and Plate-holder.
John Loeber, Brooklyn, N. Y.
363,967.—Automatically Operating Camera Shutter.
William G. Price, New Orleans, La.
364,413.—Shutter for Photographic Camera.
John J. Higgins, New York, N. Y.
364,629.—Tripod for Photographic Cameras.
Thomas H. Blair, Boston, Mass.
364,864.—Photographic Camera.
Nicholas Schroder and Edward S. Adams, Brooklyn, N. Y.
364,882.—Rubbing Down Device for Mounting Photographs.
Leo F. Adt, Waterbury, Conn.
365,256.—Stereoscope.
Gilbert D. Horton, Snohomish, Wash.
365,435.—Photographic Apparatus.
John Ripley Freeman, Lawrence, Mass.
365,879.—Photographic Apparatus.
John Baynes, Oyster Bay, N. Y.
366,060.—Photographic Printing Frame.
Leo F. Adt, Waterbury, Conn.
366,224.—Photographic Stamp Portrait Sheet.
Henry Kuhn, St. Louis, Mo.
366,225.—Photographic Apparatus.
Henry Kuhn, St. Louis, Mo.
366,584.—Finder for Photographic Cameras.
John J. Higgins, New York City.
367,176.—Photographic Paper Roll-holder.
Erastus B. Barker, New York City.
367,480.—Photographic Plate-holder.
Milan P. Warner, Holyoke, Mass.
367,610.—Apparatus for Aerial Photography.
James Fairman, New York.
367,986.—Photograph Camera Shutter.
William H. Lewis, Brooklyn, N. Y.
368,223.—Art of Producing and Transferring Picture Films to Celluloid Sheets.
William Alphonso McGill, Owensboro, Ky.

368,930.—Self-timing Photographic Camera Shutter.
CHARLES P. CALL, Boyne, Mich.
369,124.—Camera Stand
THOMAS POWERS, Perryville, Mo.
369,143.—Campound Swiveling and Clamping-joint Mechanism.
OTIS C. WHITE, Worcester, Mass.
369,165.—Photographic Instrument.
JOHN R. CANNON, Elora, Ontario.
369,453.—Vignetter.
HENRY KUHN, St. Louis, Mo.
369,515.—Finder for Photographic Cameras.
WILLARD H. FULLER, Passaic, N. J.
369,646.—Photographers' Bag Case and Plate-holder.
RICHARD KOPPE and OSWALD MOH, Goerlitz, Prussia.
369,818.—Photographic Camera.
WILLIAM SCHMID, Brooklyn, N. Y.
369,997.—Combined Photographic Camera, Shutter, and Diaphragm.
ALFRED W. SIMON, Akron, N. Y.
370,050.—Apparatus for Coating Photographic Paper.
GEORGE EASTMAN, Rochester, N. Y.
370,110.—Process of Coating Photographic Paper.
WILLIAM H. WALKER and GEORGE EASTMAN, Rochester, N. Y.
370,111.—Process of Coating Photographic Paper.
WILLIAM H. WALKER and GEORGE EASTMAN, Rochester, N. Y.
370,186.—Biographical Photograph Card.
GEORGE W. FOUNTAIN, Cameron, Mo.
370,216.—Photographic Web-holder.
ISAAC H. STODDARD, New Haven, Conn.
370,240.—Camera Tripod.
WILLIAM H. CARPENTER, Cadillac, Mich.
370,370.—Camera Plate-holder for Holding Negative Paper.
THOMAS H. BLAIR, Boston, Mass.
370,673.—Shutter for Photographic Cameras.
ROBERT E. M. BAIN, St. Louis, Mo.
370,727.—Photograph Card.
WILLIAM P. CLOUGH, Boston, Mass.
371,223.—Machine for Burnishing Photographs.
FRANK A. SIMONDS, Grand Rapids, Mich.
371,252.—Projecting Camera.
DAVID A. COOPER and WILLIAM H. LEWIS, Brooklyn, N. Y.
371,352.—Photographic Camera.
HANS P. PEDERSON, Brooklyn, N. Y.
371,458.—Photographic Camera.
JOHN S. HIGGINS, New York, N. Y.
17,032.—(Design) Tray.
GEORGE S. SKILTON, Brooklyn, N. Y.

RATES OF DOMESTIC POSTAGE

TO ANY PART OF THE UNITED STATES AND CANADA (EXCEPT NEWFOUNDLAND).—SEE NOTE H.

	cts.	oz.	See Spec'l Note.
Address Tags	1	1	*a*
Bill Heads	1	1	*a*
Blotters	1	1	*a*
Blue Prints	1	2	*d*
Books, printed	1	2	*d*
Cards, printed	1	1	*a*
" business			
" playing			
" Christmas, etc.			
" Easter			
" New Year			
Chromos	1	1	*a*
Catalogues	1	2	*d*
Circulars	1	2	*d*
Coins	1	1	*a b*
Copy (MSS.)	2	1	*e*
Desk Blotters	1	1	*a*
Drawings	2	1	*e*
Designs	2	1	*e*
Easter Cards	1	1	*a*
Engravings	1	1	*a*
Handbills	1	1	*a*
Invoices	1	1	*a*
Letters	2	1	*e*
Labels	1	1	*a*
Lithographs	1	1	*a*
Manifold Letters	2	1	*e*
Manuscript	2	1	*e*
Magazines	1	4	*d*
Merchandise	1	1	*a b*
Maps	2	1	*e*
Newspapers	1	4	*d*
New Year Cards	1	1	*d*
Packages, sealed	2	1	*b*
" unsealed	1	1	5 *b*
Pamphlets	1	2	*d*
Patterns	1	1	*a*
Periodicals	1	4	*d*
PHOTOGRAPHS	1	2	*d*
Pictures (scrap)	1	1	
Playing Cards	1	1	*a*
Postal Cards	1	ea.	*f*
Printed Matter (*not merchandise or samples*)	1	2	*d*
Printed Envelopes	1	1	*a*
Prospectuses	1	2	*d*
Proof Sheets	1	2	*d g*
Plans	2	1	*e*
Registration	10	ea.	*i*
Samples	1	1	*b*
Sample copies of regular publications mailed by publisher	1	lb.	
Sample copies of regular publications not mailed by publisher	1	1	*a*
Scrap Pictures	1	1	*a*
Specie	1	1	*a b*
Stereoscopic Views	1	2	*d*
Tickets	1	1	*a*
Type Writer Work	2	1	*e*
Valentines	1	1	*a*
Visiting Cards	1	1	*a*

GENERAL NOTES.

Cards, circulars, catalogues, etc., relating to the business of one or more firms, and different articles of all kinds and classes, may be placed in the same package, provided that the highest rate of postage that any of the contents is subject to shall be paid on the whole package.

The following articles are unmailable and will not be forwarded in any case:—Liquids, poisons, oils, ointments, greasy or fatty substances, explosive matter, inflammable articles, live or dead animals, insects (except queen bees when safely secured), substances exhaling a bad odor, gums, powdered red pepper, fresh fruits and vegetables, pastes, ink powders, obscene or indecent books, prints, writings, or papers; all postal cards or letters on the envelopes of which lewd, obscene, or lascivious delineations, epithets, terms, or language are written or printed, all matter concerning lotteries or schemes devised and intended to defraud the public, or for the purpose of obtaining money under false pretences, and all mail matter not addressed to a post office or to no particular person, firm, company, or publication.

Special Delivery.—Letters or other First Class mail matter, when bearing, in addition to the regular postage, a "special delivery" stamp (face value ten cents), will be delivered within one mile of the post office or other special delivery station, or within carrier limits, in any town of over four thousand population, between 7 a. m. and 12 midnight (except Sundays), by messengers from the delivering station.

Note A. **See also note J.**

Fourth Class Matter.—Samples and Merchandise.—Weight limited to four pounds. Postage must be fully prepaid. Merchandise may have printing on it or on the wrapper. Written marks in addition to the address are allowed on Fourth Class matter, as follows:—The name and address of sender preceded by the word "From"; also the names and number or quantity of the aticles enclosed; also on the article or on tags or labels attached thereto, either a name, number, mark, or letter for the purpose of identification. A request to the delivering Postmaster may also be written asking him to notify sender if the package is not delivered.

Note B.

Articles of the Fourth Class liable to injure or deface the mails, such as flour, sugar, glass, needles, nails, pens, etc., must first be placed in a bag, box, or open envelope, which must then be enclosed in another outside tube or box, made of metal or hard wood without sharp corners or edges, and having a sliding clasp or screw lid, thus securing the articles in a double package; if the articles are fragile they must be packed with sawdust, cotton or other packing material in the inside packet. Powdered articles, such as flour, sugar, etc., must be enclosed in a transparent bag.

Note D.

Third Class Matter.—PREPAYMENT.—Postage must be fully prepaid, otherwise will be "held for postage." THE LIMIT OF WEIGHT IS four pounds, except on single books. WRITING.—No writing is permitted on Third Class matter except as follows: The name and address of the sender on the outside or inside of package, preceded by the word "From.' On the wrapper may also be written the names and quantity of articles enclosed. The sender is further allowed to mark a word or passage in a book or paper to which he desires to call special attention. He may also write a simple inscription or dedication upon the cover or blank leaf of a book or pamphlet. Dates, addresses, and signatures of circulars may be written. Any other writing on Third Class matter will subject the package to letter rates of postage, and render the sender liable to a fine of Ten Dollars.

WRAPPING.—Mail matter of the Third Class must be so wrapped or enclosed that it can be readily examined without destroying the wrapper; otherwise it will be subject to postage at the First Class rate (two cents per ounce), as will all articles enclosed in sealed envelopes with clipped ends, sides or corners, or in boxes with covers secured by nails, and all packages the wrappers of which are secured to the enclosure by postage stamps.

Note E.

First Class.—This class includes letters, postal cards, sealed packages, all matter wholly or partly in writing (whether manuscript or produced by type-writer or copying press), drawings, designs, plans, maps, and paintings produced by hand, manuscript for publication not accompanied by proof sheets, and all personal correspondence, whether in writing or in print. (See under heads "Third Class," "Fourth Class," notes "A" and "D," certain writing permitted in or on articles of those Classes.)

The rate of postage on mail matter of the First Class (sealed or unsealed) is TWO CENTS FOR EACH OUNCE OR FRACTION THEREOF, excepting postal cards, and excepting also letters for *local delivery* posted at the post office where no letter carriers are employed, in which case the rate is ONE CENT PER OUNCE OR FRACTION THEREOF.

The law provides that the postage on all mail matter of the First Class shall be prepaid only by postage stamps or by enclosure in government stamped envelopes, and that any article of this Class (not entitled by law to free transmission in the mails) deposited in a post office wholly unpaid or prepaid *less than one full rate, can not be forwarded or delivered*, but must be "held for postage." LIMIT OF WEIGHT.—There is not limit to the weight of letters or packages of other First Class matter. WRAPPING OR ENCLOSURE.—Mail matter of the First Class may be wrapped or enclosed in any manner that the sender may desire. RETURN.—Letters not delivered will be returned to writer free, if a request to that effect is placed on the envelope. FORWARDING.—A letter will be forwarded by the Postmaster who may hold it, to another post office at the request of the person to whom the letter is addressed. Letters addressed to the care of another person, or erroneously delivered, may be redirected and returned to post office and will be forwarded without additional charge.

Note F.

Postal Cards.—No cards are "Postal Cards" except those issued by authority of the Postmaster-General (the imitation of which is forbidden and punished by law), and so-called "Postal Cards" issued by private parties are subject to letter rates of postage when they contain any written matter whatever in addition to the date, and the name of the addressed and of the sender, and the correction of mere typographical errors therein. Nothing whatever may be attached to a Postal Card except an address tag or label, which may be affixed to the *address side*, and no printing or writing is permitted upon the address side of postal cards, except that imprinted thereon at the manufactory and such as may be necessary for the proper direction of the same. Postal Cards can not be returned to the senders, and therefore requests to so return must not be printed or written on them. Postal Cards are unmailable as such when incomplete or mutilated, and in all cases where any of the above conditions are not complied with.

Note G.

Proof Sheets may be corrected or uncorrected, with or without the original manuscript, additions to or alterations in the matter, or directions as to the typographical part of the work (but not as to binding, quality of paper, etc.).

Note H.

Packages of samples of merchandise to Canada must not exceed 8 ounces in weight, and postage must be prepaid to the amount of 10 cents on each package. Samples must be confined exclusively to *bona fide* trade specimens of goods kept by the senders for sale, and must be in themselves of no value whatever except *as* samples. Articles of merchandise, or articles sent as gifts, or for use (including electrotype cuts), are absolutely excluded from mails to Canada whether in sealed or open packages or envelopes. Dutiable books from Canada are treated in the same manner as those from other foreign countries. Requests for return of undelivered letters from the United States are only complied with when *printed* on their envelopes.

Note I.

Registration.—All kinds of mail matter (except Second Class matter) can be registered at the rate of 10 cents for each package, to be fully prepaid by stamps, in addition to the postage at regular rates ; all conditions as to marks, contents and method of securing packages being the same as described under the various classes (notes *a*, *d*, *e*). Each package must bear name and address of sender, and a receipt will be returned from the person to whom addressed.

Note J.

Advertisements on Fourth Class matter now subject it to letter rates. (September, 1887.)

SECTION 371—PERMISSIBLE ADDITIONS.—Upon any package of matter of the Fourth Class the sender may write or print his own name and address, preceded by the word "from," and there may also be written or printed the number and names of the articles enclosed, and the sender thereof may write or print upon or attach to any such articles by tag or label, a mark, number, name or letter, for purpose of identification. Act of March 3, 1879. 22-20, statutes, 360.

SECTION 372—REGULATIONS FOR EXAMINATION, ETC.—Postmasters will carefully examine packages before mailing, to ascertain that no matter chargeable as of the First Class is included, and that the requirements of the foregoing statute are complied with. It is permissible to send articles of merchandise in the mails, which contain printed matter, giving descriptions, directions for use, or other information respecting the articles as part of the original packages or labels done up for sale ; but upon the face or surface of the package for mailing no other writing, printing, or marks than those authorized by the statute can be placed without subjecting the matter to first-class rates, as provided in section 375.

RATES OF POSTAGE TO FOREIGN COUNTRIES.

UNIVERSAL POSTAL UNION.

Treaty concluded at Berne, Switzerland, October 9th, 1874.

		Cts.
Letters, per 15 grams or ½ ounce (prepayment optional, except to places marked *).		5
Postal Cards, each		2
Newspapers and other printed matter, per 2 ounces		1
Commercial papers,	First 10 ounces or fraction thereof	5
	Every additional 2 ounces	1
Samples of merchandise,	First 4 ounces	2
	Every additional 2 ounces	1
Registration Fee on letters or other articles		10

All correspondence other than letters must be prepaid at least partially.

†Correspondence paid to British Indian Frontier only.

INTERNATIONAL MONEY ORDERS are issued only to Countries or Places marked ¶.

The rates will be as follows (*with the exception of Denmark, Luxemburg, the Netherlands and Norway, when a small extra fee will be charged, to pay the German Post, through which the Orders are sent*):

For sums not exceeding	$10	10 cts.
Over $10 and not exceeding	20	20 “
“ 20 “ “	30	30 “
“ 30 “ “	40	40 “
“ 40 “ “	50	50 “

☞ For Places not mentioned below, not in the Universal Postal Union, see Table page 295.

COUNTRIES OR PLACES WHICH, WITH THE UNITED STATES AND CANADA, ARE COMPRISED IN THE UNIVERSAL POSTAL UNION.

(*The Italics in brackets represent the Nationality of Foreign Possessions.*)

Abyssinia, East Africa.
Aden, Arabia, British P. O.
Africa (W. C.) Br. Colonies.
Africa (Fr. Port. & Sp. pos.)
Ajuda, Africa. (*Portuguese*)
Algeria, Africa. (*French.*)
Algeirs, Africa. (*French.*)¶
Alhucemas, N. Africa. (*Sp.*)
Amar, Asia. (*Spanish.*)
Amirante Islands, E. Africa.
Amoy, Hong Kong P. O.
Andorra, Rep. of (*Spain.*)
Angola, Africa. (*Portug'se.*)
Annoban Isl'd., Africa. (*Sp.*)
Antigua, Isl'd. W.I. (*British*)
Aracan, British India.
Argentine Republic.
Aruba, S. America. (*Dutch.*)
Asia (Dch., Fr., Pr. & Sp. Col.)
Aspinwall, U.S. of Colombia.
Assinie, Africa. (*French.*)
Austria-Hungary.¶
Azores Islands. (*Port.*)¶
Bahama Islands. (*British.*)
Bakel, Africa. (*French.*)
Balearic Isles. (*Spanish*)
Bali, Asia. (*Dutch.*)
Banca, Asia. (*Dutch.*)
Barbadoes, W. I. (*British.*)¶
Barbary (Tunis & Tripoli.)
Batavia, Java, Asia. (*Dutch*)
Bay Islands, Sp. Honduras.
Belgium.¶
Bermuda Islds., W. I. (*Br.*)
Bien-Hoa, Coch.-China. (*Fr*)
Billiton, Asia. (*Dutch.*)
Bissao, Africa. (*Portug'se.*)
Bogota, U.S. of Colombia.
Bolivia, South America.
Bonaire Islds., W.I. (*Dutch.*)
Borneo, Asia. (*Dutch.*)
Bourbon, Isld., Africa. (*Fr.*)
Brazil, South America.
Bulgaria, Principality of
Burmah, British India.
Cabul, Afghan, *via* Italy.*†
Cacheo, Isid., Africa. (*Port*)
Cambodia, Fr. P. Offices in.
Canary Islands. (*Spanish.*)
Canton, Hong Kong, P. O.
Cape Verde Is., Afr. (*Port.*)
Caroline Is., Oceanica. (*Sp.*)
Carthagena, U. S Colombia.
Casablanca, Morocco. (*Sp.*)
Celebes, Asia. (*Dutch.*)
Ceuta, N. Africa. (*Spanish.*)
Ceylon. (*British.*)
Chaffarine Is., N. Afr. (*Sp.*)
Chandernagore, India. (*Fr.*)
Chili, South America.
China, *via* Russia.
China, *via* Hong Kong.
China, *via* France.
Cochin China (French Col. in)
Colombia (U.S. of) S. Amer.
Comino, Malta. (*British.*)
Cominotto, Malta. (*British.*)
Congo (State of) W. Africa.
Constantinople, Turkey.¶
Corisco Is., Africa. (*Sp.*)
Costa Rica, Cent'l America.
Cuba, W. I. (*Spanish.*)
Curacoa Is., W.I. (*Dutch.*)
Cyprus Island, (*British.*)
Dagana, Senegal. (*French.*)
Damao, Asia. (*Portuguese.*)
Denmark.¶
Desirade Isld., W. I. (*Fr.*)
Diu, Asia. (*Portuguese.*)
Dominica Isld., W. I. (*Brit.*)
Dominica, Rep. of, W. I.
Ecuador, S. America.
Egypt, Africa.¶
Falkland Is., S. Amer. (*Br.*)
Faroe Islands, Denmark.
Fernando Po. Is., Afr., (*Sp.*)
Finland, Gr. Duchy, Russia.
Flores, Asia. (*Dutch.*)
Foo-chow, Hong Kong P. O.
Formosa, *via* Hong Kong.
France.¶
French Colonies, all.
Fusam-po, Corea, Jap. P.O.
Gaboon, Senegal. (*French.*)
Gambia, W. Africa. (*Br.*)
Gambier, Is., Oceanica. (*Fr*)
Genzanshin, (Corea.) Japanese P. O. at.
Germany.¶
Gibraltar, Spain. (*British.*)
Goa, Asia. (*Portuguese.*)
Gold Coast, W. Africa. (*Br.*)
Goree, Senegal. (*French.*)
Gozzo, Malta. (*British,*)
Grand Bassam, W. Afr. (*Fr*)
Great Britain.¶
Greece.
Greenland, N. America.
Grenada, Isld., W. I. (*Br.*)¶
Grenadines Is., W. I. (*Br.*)
Guadeloupe Is., W. I. (*Fr.*)
Guadur, British India.

RATES OF POSTAGE TO FOREIGN COUNTRIES—*Continued.*

Guatemala, Centr. America.
Guiana, Br., Fr. and Dutch.
Hankow, Hong Kong P. O.
Hawaii, Sandwich Islands.¶
Hayti, Isld., W. I.
Hatien, Cochin China. (*Fr*)
Heligoland Isld., Germany.
Hindostan, British India.
Hoihow, Hong Kong P. O.
Honduras, Br. C. America.
Honduras, Rep. C. America.
Hong Kong, China.¶
Hungary.
Hyderabad, Ind., *via* Italy.*†
Iceland Isld., Denmark.
India, British.¶
India (French Est'blish'ts in)
Ionian Isles, Greece.
Ireland.¶
Isle of Pines, Oceanica. (*Fr*)
Italy.¶
Jamaica, Isld., W. I. (Br.)¶
Japan, Asia.¶
Java, Batavia, Asia. (*Dutch*)
Jinsen (Corea), Jap. P. O. at
Kalgan, China, *via* Russia.
Karikal, India. (*Fr.*)
Kashmir, Ind., *via* Italy.*†
Kiung-Chow, H'g K'g P. O.
Kolkar, Br. Ind. *via* Italy.†
Labuan, Philippine Isl. (*Br.*)
Ladakh, Thibet, *via* Italy.*
Ladrone Is., Oceanica. (*Sp.*)
Lagos, W. Africa. (*Br.*)
Larrache, Morocco. (*Span.*)
Les Saintes, Is., W. I. (*Fr.*)
Leeward Is., W. I. (*Br.*)
Liberia, Africa.
Lichtenstein, Princ. Austria.
Lombok, Asia. (*Dutch.*)
Low Islds., Oceanica. (*Fr.*)
Loyalty Is., Oceanica. (*Fr.*)
Luxemburg (Gr. Duchy of).¶
Luzon, Philippine Is. (*Sp.*)
Macao, Hong Kong P. O.
Macassar, Asia. (*Dutch.*)
Madagascar Isls., Afr. (Ste. Marie and Tamatave *only*)
Madeira, Isld., Portugal.¶
Madura, Asia. (*Dutch*)
Mahe, India. (*French.*)
Malacca, Straits Sett's. (*Br*)
Malta, Isld. (*British.*)
Mandalay, Br. Indian P. O.
Manila, Philippine Isls. (*Sp.*)
Mariana Is., Oceanica. (*Sp.*)
Marie Galante, Is., W. I. (*Fr*)
Marquesas Is., Oce'ca. (*Fr.*)
Martinique Is., W. I. (*Fr.*)
Massowah, R. Sea (It. P. O. at)
Mauritius Is., Africa. (*Br.*)
Mayotte, W. Africa. (*Fr.*)
Mazagan, Morocco. (*Span.*)
Mililla, N. Africa. (*Span.*)
Mexico, N. America.
Mindanao, Philip'ne Is. (*Sp.*)
Miquelon, Is., N. Am. (*Fr.*)
Mogador, Morocco. (*Sp.*)
Moldavia, Roumania.
Moluccas, Asia. (*Dutch.*)
Monaco, Princip. of, France.
Montenegro.
Montserrat, W. I. (*British.*)
Morocco, Fr. & Sp. P. O. in
Mozambique, Africa. (*Port.*)
Muscat, British Indian P. O.
Mysore, Br. Ind., *via* Italy.†
Mytho, Cochin China. (*Fr.*)
Nassau, N. P. Bahamas. (*Br*)
Netherlands.¶
Netherland Colonies in Asia, America and Oceanica.
Nevis, Isld., W. I. (*British.*)
New Caledonia, Ocea. (*Fr.*)
Newfoundland.
New Guinea, Oce'ca. (*Dutch*)
Nicaragua, Centr. America.
Ning-po, Hong Kong, P. O.
Norway.¶
Nossi-be, W. Africa. (*Fr.*)
Nubia, Egypt.
Ourga, China, *via* Russia.
Palawan, Philip'ne Is. (*Sp.*)
Panama, U. S. of Colombia.
Panay, Philip'ne Isl. (*Sp.*)
Papua, Oceanica. (*Dutch.*)
Paraguay, S. America.
Patagonia, S. America.
Pegu, British India.
Pekin, China, *via* Russia.
Penang, Straits Settlts. (*Br.*)
Penon de Gomera, N. Af. (*Sp*)
Persia, Asia.
Persian Gulf, Br. Ind. P. O.
Peru.
Philippine Is., Ocea. (*Sp.*)
Pines, Isle of, Oceanica.
Pondicherry, India. (*Fr.*)
Porto Rico, W. I. (*Span.*)
Portugal.¶
Port. Col'o's, Asia & Africa.
Poulo-Condor, C. China. (*Fr*)
Prince, Isld, Africa. (*Port.*)
Rabat, Morocco. Spa. P.O.
Reunion Isld. Africa. (*Fr.*)
Rhio Riouw, Asia. (*Dutch.*)
Rodrigues Is., Africa. (*Br.*)
Roumania.
Russia.
Saba Islds, W. I. (*Dutch.*)
Saffi, Morocco, Span. P. O.
Saigon, Cochin China. (*Fr.*)
Salvador, Central America.
Sandwich Islds., Oceanica.
San Domingo Republic, W. I.
San Marino Republic, Italy.
Senegal, W. Africa. (*Fr.*)
Senegambia, W. Africa. (*Br*)
Servia.
Seychelles, Is., Africa. (*Br.*)
Shanghai (Fr. Hong Kong, and Japanese P. O. at)
Shanghai *via* Hong Kong.
Shanghai *via* France.
Siam, Asia.
Sierra Leone, W. Af. (*Br.*)
Singapore, Asia. (*British.*)
Soudan, Egypt.
Spain.
Spanish Colonies in Asia, Africa, America & Oce'ca.
St. Bartholomew, Is'd, W. I. (*Swed.*)
St. Christopher I., W. I. (*Br.*)
St. Croix Isl., W. I., (*Dan.*)
St. Domingo, Republic, W. I.
St. Eustatius Is., W. I. (*Dut*)
St. John Is., W. I. (*Dan.*)
St. Kitt's Is., W. I. (*Br.*)
St. Lucia Is., W. I. (*Br.*)¶
St. Louis, W. Africa. (*Fr.*)
Ste. Marie Madagasc'r. (*Fr.*)
St. Martin, W. I. (*Fr. & Dut*)
St. Pierre, W. I. (*French*)
St. Thomas Is., W. I. (*Dan.*)
St. Thome Is., Afr., (*Port.*)
St. Vincent, W. I., (*Br.*)¶
Staten Island, S. America.
Straits Settlem'ts, Asia. (*Br*)
Sumatra, Asia. (*Dutch.*)
Sumbawa, Asia. (*Dutch.*)
Surinam, S. America. (*Dut.*)
Swatow, Hong Kong P. O.
Sweden.¶
Switzerland.¶
Tahiti Isld., Oceanica. (*Fr.*)
Tamatave, Madagasc'r. (*Fr*)
Tangier, F. & Span. P. O.
Tenasserim, British India.
Tetuan, Morocco, Sp. P. O.
Tien-Tsin, China, *via* Russia.
Timor, Asia. (*Dut. & Port.*)
Tobago Isld., W. I. (*Br.*)¶
Tonquin (French P. O. in).
Touboual, Oceanica. (*Fr.*)
Trinidad Isld., W. I. (*Br.*)
Tripoli (Italian P. O. at)
Tschandok, Co. China. (*Fr.*)
Tuamotou, Oceanica. (*Fr.*)
Tunis, (Fr. and Italian P. O.)
Turkey—Europe and Asia.
Turk's Island, W. I. (*Br.*)
Uruguay, S. America.
Venezuela, S. America.
Vingh-Long, C. China. (*Fr.*)
Virgin Isles, W. I. (*British.*)
Wallachia, Roumania.
Yanaon, India. (*French.*)
Zanzibar, Afr., *via* Aden.*

COUNTRIES OR PLACES NOT IN UNIVERSAL POSTAL UNION.

Prepayment is compulsory, *except* to places marked *.

† The limit of payment is at port of debarkation ; for all other places, to destination.

‡ Samples are not accepted for these destinations.

§ Registration is allowed on letters and other articles. Fee, 10 cents.

‖ Registration is allowed *only* on letters. Fee, 10 cents.

¶ Money orders are issued at same rates as specified at top of page 327.

Postal cards can not be sent from the United States to any of the following places *except* Canada.

COUNTRIES OR PLACES OF DESTINATION.	PER 15 GRAMS, OR ½ OUNCE.	NEWS-PAPERS.		OTHER PRINT'D MATTER AND SAMPLES	
		LIMIT OF WEIGHT.	EACH PAPER.	LIMIT OF WEIGHT.	EACH PACKAGE.
	Cts.	Oz.	Cts.	Oz.	Cts.
Africa (West Coast), except Liberia, and British, French, Spanish and Portuguese Colonies, by British Mail †	15	4	4	2	5
Ascension Island, S. Atlantic, British Mail	15	4	4	2	5
Australia, except N. S. Wales, Queensland, and Victoria, *via* San Francisco †‡‖	5	no	2	2	2
Australia, all parts, by British Mail, *via* Brindisi *‖	12	no	2	4	4
Basutoland, *see* Cape Colony.					
Bechuanaland, S. Africa, British Mail *§	21	4	5	2	7
British Columbia, *see* Canada.					
Caffraria, *see* Cape Colony.					
Canada (*Limit of Letter Weight: 30 grams, or* 1 *oz. Postcards and all printed matter at domestic rates*) §¶	2	4	1	8	10
Cape Colony, S. Africa, British Mail §¶	15	4	4	2	5
Chatham Islands, Oceanica, *via* San Francisco ‖	12	no	2	4	4
China, British Mail, *via* Brindisi *§	13	4	5	2	4
Fiji Islands, *via* San Francisco and Sidney †‡	5	no	2	2	2
Griqualand, *see* Cape Colony.					
Madagascar, except St. Mary's and Tamatave, by British Mail. †	23	4	6	2	7
Morocco, except Spanish Possessions on West Coast †	15	2	2	2	2
Natal, S. Africa, by British Mail §	15	4	4	2	5
Navasa, West Indies, direct mail †‡	5	no	2	2	2
Navigator's Islands, Pacific †‡	5	no	2	2	2
New Brunswick, *see* Canada.					
New South Wales, *see* Australia. ¶					
New Zealand, *via* San Francisco ‖¶	12	no	2	4	4
New Zealand, British Mail, *via* Brindisi *‖¶	12	no	2	4	4
Norfolk Island, Pacific, *via* San Francisco ‖	12	no	2	4	4
Nova Scotia, *see* Canada.					
Orange Free State, *see* Cape Colony.					
Pitcairn Island, Pacific ‡	5	no	2	2	2
Prince Edward Island, *see* Canada.					
Queensland, *see* Australia ¶					
St. Helena, South Atlantic, British Mail *§	15	4	4	2	5
Samoan Islands, *see* Navigator's Islands.					
Shanghai, direct, *via* San Francisco ‡‖	5	no	2	2	2
Tasmania, *see* Australia ¶					
Transvaal, South Africa, British Mail *§	21	4	5	2	7
Vancouver's Islands, *see* Canada.					
Van Dieman's Land, *see* Australia.					
Victoria, *see* Australia ¶					
West Indies, all places not in Postal Union, direct mail †‡	5	no	2	2	2

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MOSS ENG. CO. N.Y.

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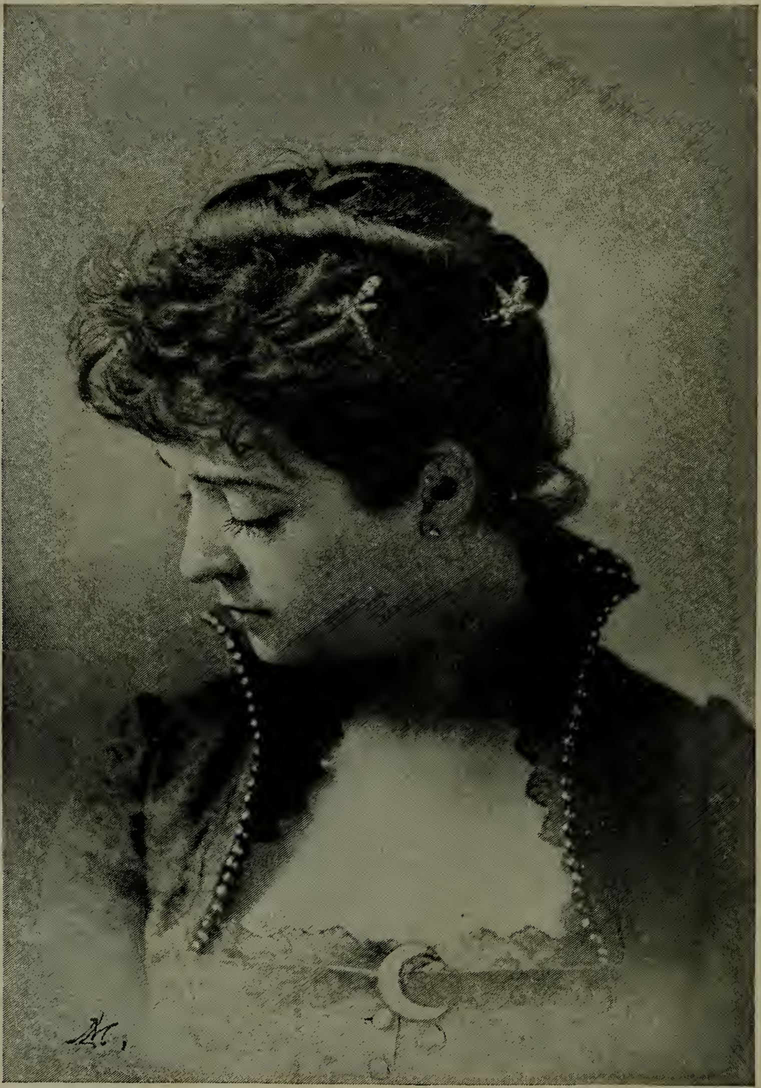

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FROM THE PACIFIC COAST.

San Francisco, May 11th, 1887.

Prosch Mfg. Co.

Gentlemen—I enclose a letter from Mr. A. J. Treat, which he sent to me to forward to you, from which you will see he is much pleased with his shutter. I think Mr. Treat is only echoing the sentiments of all of the amateurs on this coast who have used your shutters.

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Very truly yours,

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Vice-Pres't Pacific Coast A. P. A.

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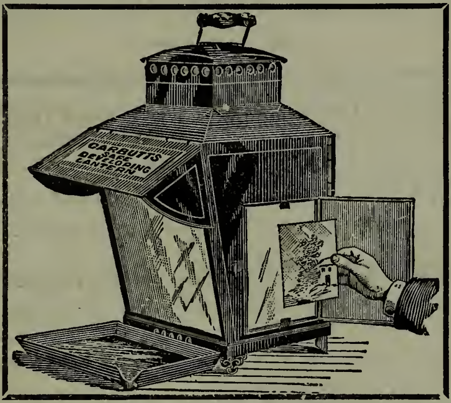

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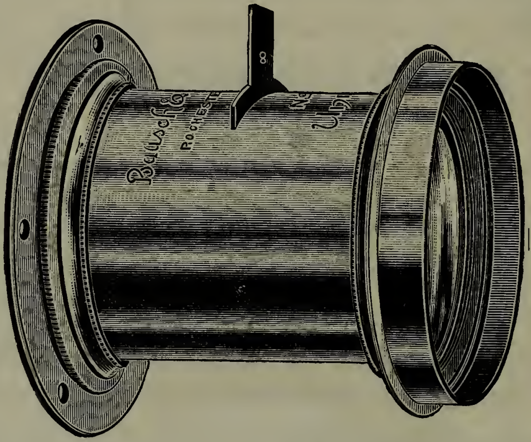

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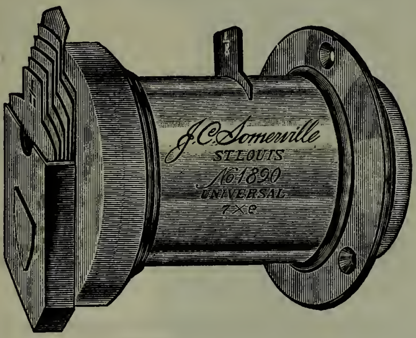

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A full set of six stops, numbered according to the method adopted by the Photo Society of Great Britain, accompanies each Lens.

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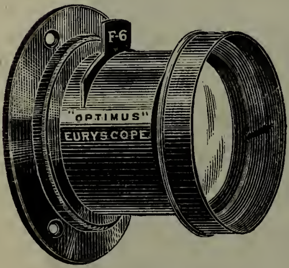

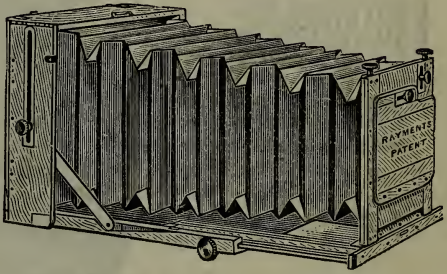

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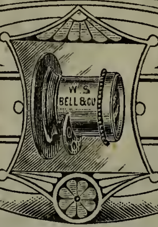

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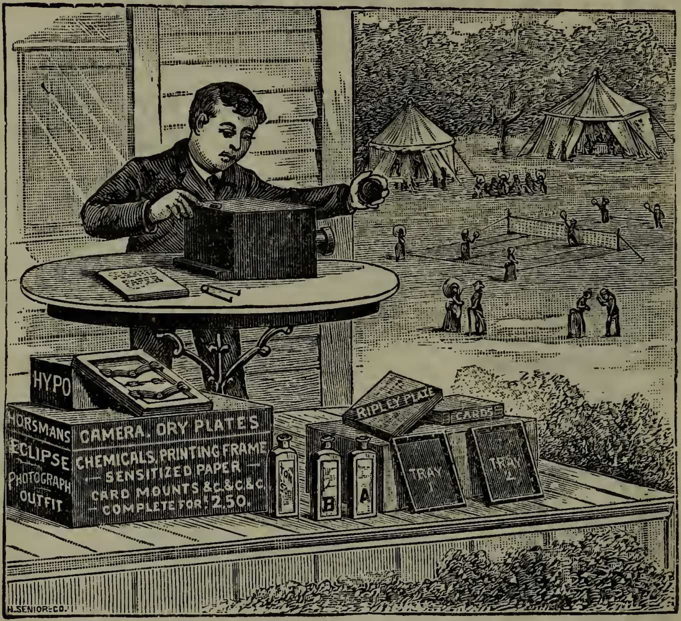

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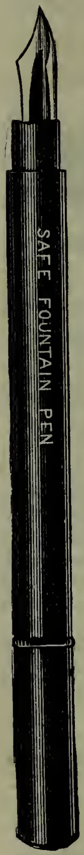

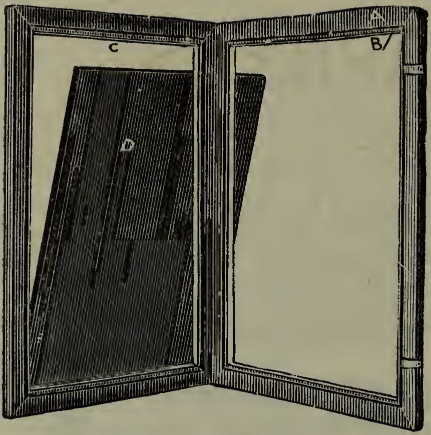

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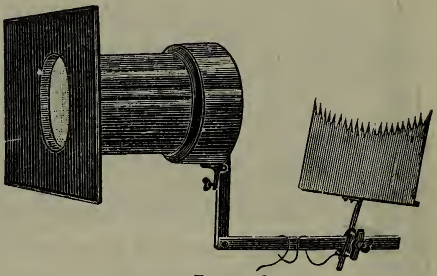

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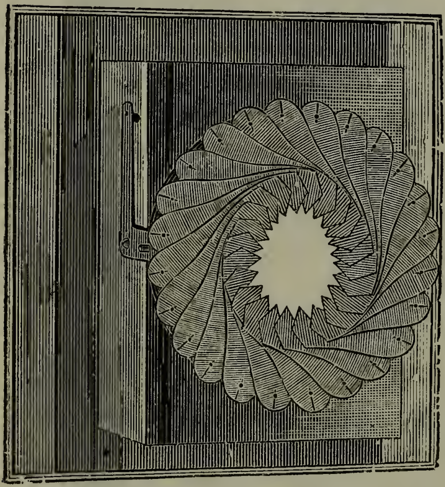

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French Azotate (For Toning Prints). Price, per bottle..........$	25
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Flandreau's S. P. C. Hypo Eliminator (For Removing every trace of Hyposulphite of Soda from Negatives and Prints). Price, per bottle, with book of testing paper........................	50
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CLASS OF 1888, "AURORA."

MOTTO:—"And there was light."

The School for 1888 will open at Chautauqua on or about July 1st, with two classes.

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Course of Ten Lessons,	$5.00
Half Course,	3.00
Special Lessons,	1.00

A practicing class for the winter months will be opened at the School Headquarters on or about January 1st, 1888. Students are admitted to the corresponding class at any time from October 1st to May 1st..

For further particulars, address,

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(PATENTED.)

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Platinotypes are the only photographic prints (excepting Carbon prints), that will withstand all the acid and alkali tests. No other purely photo-chemical prints are permanent.

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Proprietors of the Patents,

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Specimens will be submitted and Brush sent on approval.

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ROLL HOLDER.

LABEL REGISTERED. 1885.

THIS new holder has the following advantages over all previous patterns: **A Reduction in Weight, a Reduction in Size, a Reduction in Number of Parts, a Reduction in Price.**

The metal inside frame has been dispensed with and the working parts attached directly to the wood case, which has been strengthened to bear the strain, the result being a stronger, simpler and cheaper Holder, less liable to get out of repair.

Figure 1 shows the Holder closed.

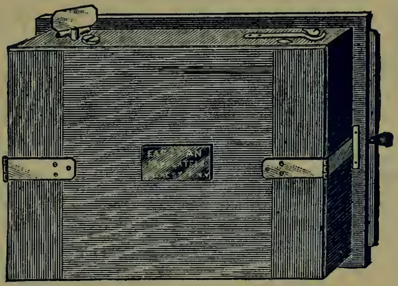


FIG. 1.—Model of 1887.
Patented May 5. 1885; other patents applied for.

FIGURE 2 shows the cover removed and the case detached from the shutter frame.

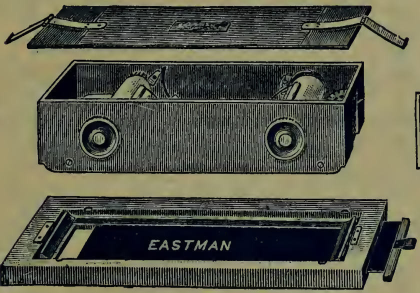


FIG. 2.

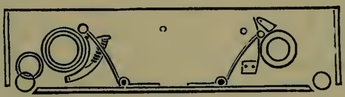


FIG. 3.

FIGURE 3 is a sectional view of the Holder loaded with the spool of film.

PRICES OF MODEL OF 1887 ROLL HOLDERS.

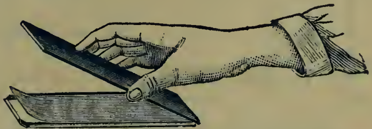
Size.	Price.	Size.	Price.	Size.	Price.
3¼ x 4¼	$ 9 00	4¾ x 6½	$12 50	6½ x 8½	$16 00
4 x 5	10 00	5 x 7	12 50	8 x 10	20 00
4¼ x 5½	10 00	5 x 8	12 50	10 x 12	24 00
4¼ x 6½	10 00				

FRENCH AND GERMAN SIZES.

Size.	Price.	Size.	Price.
9 x 12 cm	$ 9 00	18 x 24 cm	$16 00
13 x 18 "	12 50	21 x 27 "	20 00

All fitted with the new single revolution audible indicator.

FILM CARRIERS.



FILM CARRIERS are used to expose single sheets of American Film in ordinary double slides, they are made in all sizes and can be used in any camera.

The Carrier consists of a light metal frame which clamps the edges of the cut sheet of film flat against a thin board. The device is simple and effective, and is recommended for trial where the expense of a roll holder is an objection.

PRICES OF FILM CARRIERS.

PATENTED MAY 5, 1885.

	3/32 in. thick.	⅛ in. thick.	3/16 in. thick.
3¼ x 4¼, - -	$0 25	$0 25	——
4 x 5, - -	30	30	——
4¾ x 6½, - -	30	——	——
5 x 7, - -	35	——	35
5 x 7½, - -	35	——	——
5 x 8, - -	35	35	35
6½ x 8½, - -	40	40	40
8 x 10, - -	50	50	50

	3/32 in. thick.	⅛ in. thick.	3/16 in. thick.
10 x 12, - -	——	——	$0 60
11 x 14, - -	——	——	75
14 x 17- - -	——	——	1 00
FRENCH AND GERMAN SIZES.			
9 x 12, - -	25	——	——
13 x 18, - -	35	——	——
18 x 24, - -	50	——	——
21 x 27, - -	50	——	——

Sizes not mentioned are not made and cannot be furnished.

In ordering carriers specify which thickness is wanted. The thicker the carrier the more rigid.

Double Holders that have the plate slide in from the end require the thinnest carrier. (3-32).

Holders of the "book" form will take the ⅛ inch carriers when the septum is removed. As the carriers are opaque, the septum is not required.

Wet Plate Holders require the 3-16 carriers.

Prices of Eastman's American Films.

PATENTED OCTOBER 14, 1884.

CUT SHEETS.

SIZE.			PER PKG.
3¼ x 4¼—2 dozen Package,			$0 70
4 x 5	"	"	1 00
4¾ x 6½	"	"	1 50
5 x 7	"	"	1 75
5 x 7½	"	"	1 90
5 x 8	"	"	2 00
6½ x 8½	"	"	2 80
8 x 10	"	"	4 00

SIZE.				PER PKG.
10 x 12—1 dozen Package,				$3 00
11 x 14	"	"		4 00
FRENCH AND GERMAN SIZES.				
9 x 12 cm, 2 dozen Packages,				$0 75
13 x 18	"	"	"	1 75
18 x 24	"	"	"	3 60
21 x 27	"	"	"	4 60

Other sizes in proportion.

ON PATENT SPOOLS TO FIT THE EASTMAN-WALKER ROLL HOLDER.

SIZE.					PRICE.
3¼ in.	for 24	3¼ x 4¼	Exposures.		$0 85
4 "	"	4 x 5	"		1 10
4¼ "	"	4¼ x 6½	"		1 55
4½ "	"	4½ x 7½	"		2 00
4¾ "	"	4¾ x 6½	"		1 75
5 "	"	5 x 8	"		2 20
6½ "	"	6½ x 8½	"		3 00
8 "	"	8 x 10	"		4 50

SIZE.					PRICE.
10 in.	for 24	10 x 12	Exposures.		$6 75
11 "	"	11 x 14	"		9 00
SPOOLS FOR FRENCH & GERMAN SIZES.					
9 cm.	for 24	Exposures.	9 x 12 cm,		$0 90
13 "	" 27	"	13 x 18	"	2 20
18 "	" 24	"	18 x 24	"	4 00
21 "	" 24	"	21 x 27	"	5 30

Prices of Gelatine Skins.

SIZE.			PER PKG.
3¼ x 4¼—2 doz. in pkg.,			- $0 20
4 x 5	"	"	- 25
4¼ x 5½	"	"	- 30
4¼ x 6½	"	"	- 35
4¾ x 6½	"	"	- 40
5 x 7	"	"	- 40
5 x 7½	"	"	- 50
5 x 8	"	"	- 50
6½ x 8½	"	"	- 70
8 x 10	"	"	- 1 00
10 x 12—1 doz. in pkg.,			- 75

SIZE.			PER PKG.
11 x 14 —1 doz. in pkg.,			- $1 00
14 x 17	"	"	- 1 50
16 x 20	"	"	- 2 00
18 x 22	"	"	- 2 50
20 x 24	"	"	- 3 00
24 x 30	"	"	- 4 00
FRENCH AND GERMAN SIZES.			
9 x 12 cm. - - - -			- $0 25
13 x 18 " - - - -			- 40
18 x 24 " - - - -			- 1 00
21 x 27 " - - - -			- 1 30

Eastman's Gelatine Skins are made especially for use with American Films, and no others should be used.

Plain Collodion.

Fifty cents per 8 ounce bottle.

Rubber Solution.

Twenty-five cents per eight oz. bottle.

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IN

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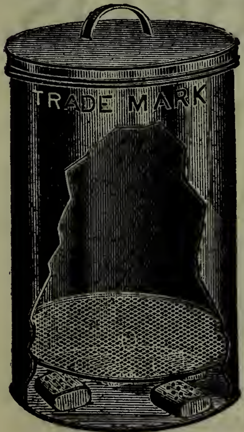

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It will save the average photographer every year five times what it costs to use, saying nothing of the convenience of having sensitized paper always ready for use.

It is as valuable in winter, and will pay for itself five times over in the saving of time, labor and gold, as where paper is kept two or three days it tones much easier than without it, and requires less gold.

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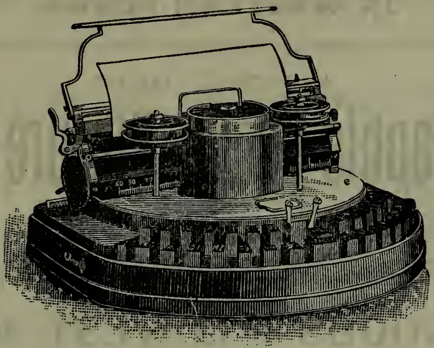

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4¼ x 5½ ...	30	10 x 12	1 35	20 x 24....	5 50
4¼ x 6½....	33	10 x 14	1 60	22 x 27....	7 00
4¾ x 6½....	35	11 x 14	1 80	24 x 30....	8 25
5 x 7	40	12 x 15	2 00	25 x 30...	8 50
5 x 7½....	42	14 x 17	2 70	24 x 36....	10 00
5 x 8	45	16 x 20	3 60	30 x 40....	13 50

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12 "	40	20 "	67	30 "	1 00
14 "	47	22 "	74	31 "	1 05

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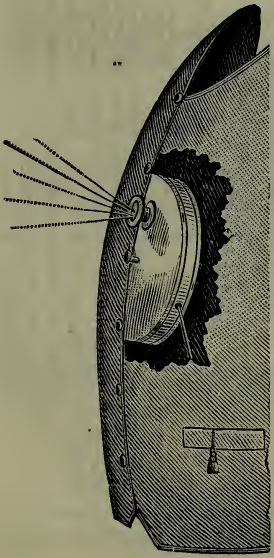

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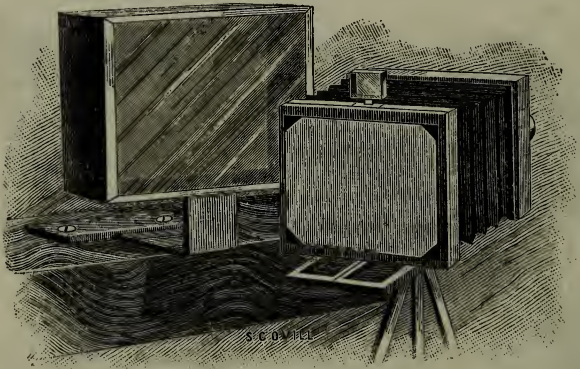

Patented September 6, 1887.

The Scovill Magic Finders will at once be preferred to any and all others. One sees through them a marvelously clear *non-reversed* image *the exact proportion* of the reversed one on the ground-glass. The Magic Finders are light, ornamental, easily adjusted and detached, and will certainly be pronounced a great convenience by all view takers.

PRICE - LIST.

No. 1, for 4 x 5 Camera,	$1 50
" 2, " 5 x 8 "	1 75
" 3, " 6½ x 8½ "	2 25
" 4, " 8 x10 "	2 75

EXAMINE A SAMPLE, AND BE CONVINCED OF THEIR SUPERIORITY

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The RIPLEY Plate.

ACKNOWLEDGED to be unapproached for exquisite graduation of tone, giving perfect detail of printing quality from the highest lights to the deepest shadows, thus producing CORRECT reproductions of the objects photographed. When handled as directed, they do not require forcing in development or intensifying afterwards.

Portrait and Instantaneous.

The most rapid plate in the market—indispensable for the Detective Camera.

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Of most exquisite quality and fair speed, it is preëminently THE plate for out-door work and photo-micrography.

Landscape and Transparency.

The plate chosen by the International Photographic Exchange as the best for Lantern Slides. A slow plate of unique qualities.

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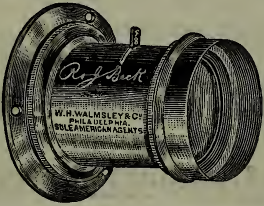

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FOR ARTISTS AND THE TRADE.

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Chemicals for Photographers' Use.

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USE IT EXCLUSIVELY.

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Eastman's Transferotype Paper.

PATENTED OCTOBER 14th, 1884.

For making Bromide of Silver Positives, transferable to Opal Glass, Placques, Tiles, Lamp Shades, Canvas, Lantern Slides, Window Transparencies, Engravers' Blocks, etc., etc.

Contact or enlarged prints are made upon this paper in precisely the same manner as upon the well known "permanent Bromide Paper" (the same emulsion being used for both). After washing, the print is laid face down upon the object to which it is desired to transfer the picture; after drying under pressure, the paper is removed by the application of hot water, leaving the print upon the object where it was dried. The operation is simple, easy, and certain, and the results **surpassingly beautiful.**

By this process opals, window and lantern transparencies, can be made with less trouble and cost than by any known process. Send for circulars. Sample print ready to transfer, six cents, stamps.

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Send lists with price of any works on Photography in French, German, or English.

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THE AMERICAN OPTICAL COMPANY'S

APPARATUS,

INCLUDING ALL STYLES OF

Cameras; Enlarging, Reducing, Copying and Multiplying Boxes; Tripods; Plate-Holders, for Wet or Dry-Plates; Printing Frames; Amateur Outfits, etc., etc., has long been

UNRIVALED FOR BEAUTY OF DESIGN,

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UNAPPROACHED FOR FINENESS OF FINISH.

THEY ALWAYS GIVE UNQUALIFIED SATISFACTION.

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Reputable Photographic Dealers,

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SCOVILL MANUFACTURING CO.,

423 BROOME STREET,

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W. IRVING ADAMS, Agent.

Send for Latest Catalogue.

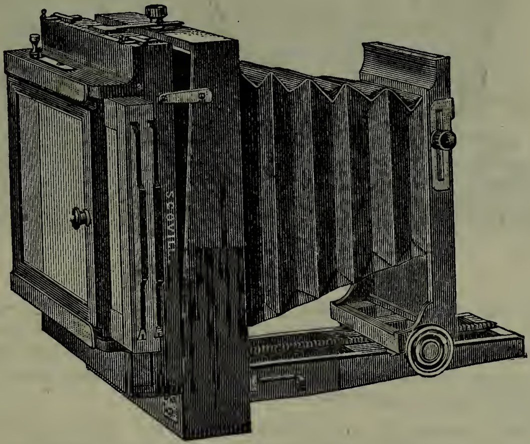
ST. LOUIS
REVERSIBLE BACK CAMERAS.

(PATENTED.)

Made by AMERICAN OPTICAL CO.,

IN addition to the desirable features which the Back Focus Reversible Camera possesses (see description below) the St. Louis Reversible-Back Cameras have the rack and pinion movement, *patent latch* for making the bed rigid instantaneously, and the ground-glass so arranged that the holder may be slid in front of it, as shown in the illustration.

Each Camera is supplied with one Daisy Holder with *patent Registering Slides* and canvas case.



THE growing use of dry plates, and the desire for rapid exposures, led to the introduction of the American Optical Patented Reversible Back Cameras, and because they add to the grace and celerity of view-taking they have become vastly popular. A novel arrangement of a detachable carriage at the back combines such a multiplicity of adjustments in itself that a dry-plate holder *may be reversed or be set for either an* 8x10 *upright or horizontal picture*—all of these movements, without once changing the dry-plate holder in the carriage.

SAINT LOUIS REVERSIBLE-BACK CAMERAS.

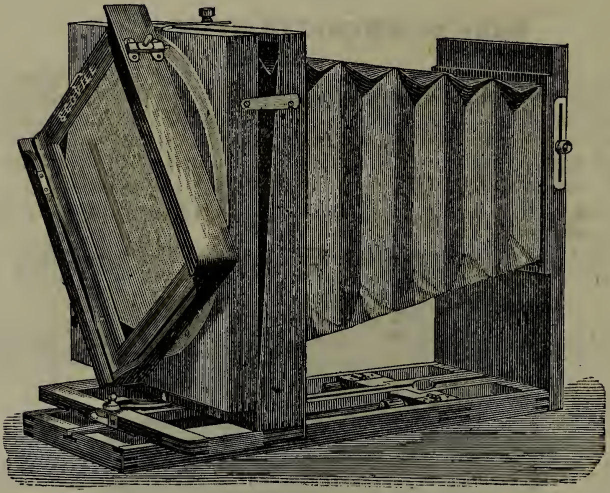
			Fitted with Eastman-Walker Roll Holder. New Model with Automatic Tally.	
For View.	**Single Swing-back.**	**Double Swing-back.**	**Single Swing-back.**	**Double Swing-back.**
4 x5	$25 00	$29 00	......	......
4¼x5½.....	26 00	30 00	......	......
4¼x6½.....	30 00	34 00	......	......
5 x7	32 00	35 00	$52 00	$55 00
5 x8	34 00	38 00	54 00	58 00
6½x8½.....	36 00	40 00	60 00	64 00
8 x10	40 00	44 00	70 00	74 00
11 x14	60 00	64 00	102 00	106 00

Not made above 11x14 size.

Revolving-Back Cameras.

(PATENTED.)

Each Incased in a Canvas Bag, with Handle.



(BACK FOCUS PATTERN.)

"These are the finest View Cameras ever constructed," so says every photographer who has examined any of them, and this exclamation is not merely a tribute to the beauty and grace of their design, for invariably the desire has at the same time been expressed to possess one of these truly novel and substantial Cameras.

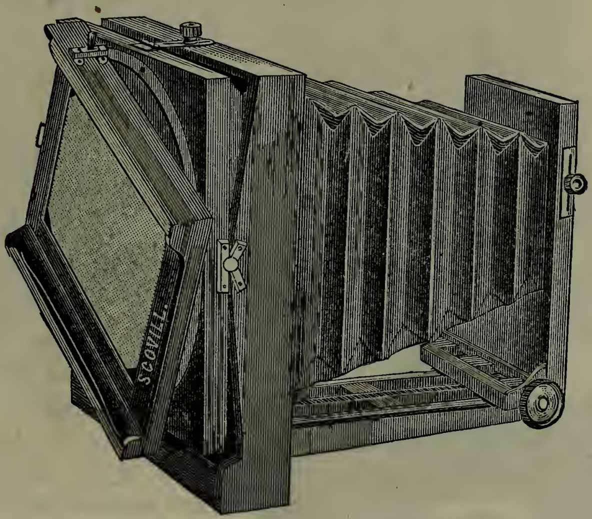
Wherein lies the merit and attractiveness of the Revolving-Back Camera, that photographers want to cast aside cameras now in use and procure one of this new pattern? Briefly stated, it enables the view taker to secure either an upright or a horizontal picture without changing the plate holder after it has been slid into the carriage. No other camera can with such wondrous ease and celerity be changed from the vertical to the upright or *vice versa*. The carriage is simply turned about in the circle and automatically fastened. By this latter provision the carriage may be secured at either quarter of the circle. Ordinarily, the slide will be drawn out of the holder to the right; but in certain confined situations, the ability to withdraw the slide to the left enables the photographer to obtain a view which he could not get with the usual provision in a camera. The photographer of experience is well aware of the difficulty, when taking an upright picture with a large camera without the revolving back feature, of reaching up to draw out the slide at the top, and, what is more essential, of getting out the slide without fogging the plate in the holder.

Grace and strength are combined in the Revolving-Back Camera, and its highly-desirable features are gained without the sacrifice of steadiness or any other essential principle in a good camera. Indeed, its merit is such that out-door photography has been advanced and made more attractive by its introduction.

For a more detailed description, consult Scovill's General Catalogue.

REVOLVING-BACK CAMERA.

(PATENTED.)



(FRONT FOCUS PATTERN.)

PRICE LIST.

Revolving-back Cameras, each incased in a canvas bag, with handle, and above 17x20 size, with two handles.

					Fitted with Eastman-Walker Roll Holder New Model, with Automatic Tally.	
		REVERSIBLE.	Single Swing.	Double Swing.	Single Swing.	Double Swing-back.
550A.	For View	4 x 5 in	$31 00	$36 00	$46 00	$51 00
551.	“	4¼x 5½ “	33 00	38 00	......	......
551AB.	“	4¼x 6½ “	34 00	39 00	......	......
551A.	“	5 x 7 “	35 00	40 00	55 00	60 00
551B	“	5 x 8 “	35 00	40 00	55 00	60 00
552.	“	6½x 8½ “	45 00	50 00	69 00	74 00
553.	“	8 x 10 “	50 00	55 00	80 00	85 00
554.	“	10 x 12 “	65 00	70 00	101 00	106 00
555.	“	11 x 14 “	77 50	82 50	119 50	124 50
556	“	14 x 17 “	90 00	95 00	140 00	145 00
557.	“	17 x 20 “	105 00	110 00	170 00	175 00
557A.	“	18 x 22 “	110 00	115 00	185 00	190 00
558.	“	20 x 24 “	120 00	130 00	200 00	210 00
559.	“	25 x 30 “	165 00	175 00	......	......

These Cameras are fitted with Daisy Dry-plate Holders.

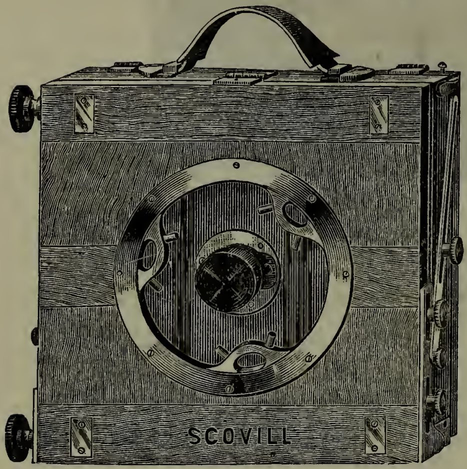
☞ Please state, when ordering any size below 10x12, whether front or back focus is desired.

Revolving-back Cameras, with front focus not made above 8x10 size.

Albion Cameras.

THE following illustrations and description are given to assist in determining the choice of those who want a camera that is "quite English, you know."

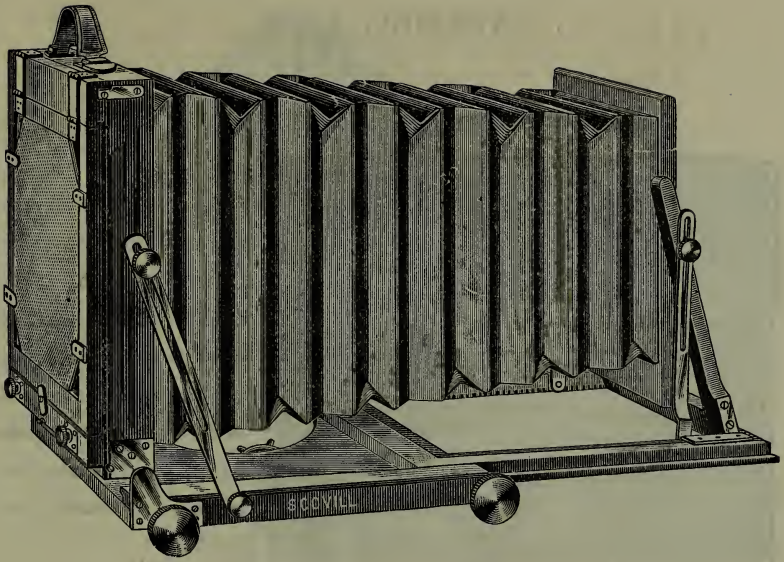
TURN-TABLE.



CAMERA OUT OF CASE.

The Albion Cameras are provided with the Scovill turn-table, whose excellence is due, not only to the fact that it has an open center into which the lens projects, thus doing away with the necessity of unscrewing the lens every time the front board of the camera is turned down in order to fold the camera, but what is of equal importance, the bearings of the turn-table are so nicely adjusted, that they do not become clogged at any time—a defect in all imported cameras. There is also no need of a regulator or fastener for this turn-table. In whatever direction the camera is turned it remains until moved by the photographer. The extreme accuracy and nicety of the working of the Scovill turn-table can only be fairly appreciated when tried.

Compactness. Before passing from the Scovill turn-table, it is well to bear in mind that serving as a tripod top, it does away with the necessity of any other, and the bothersome tripod screw. In the highest degree, compatible with the requisite strength, the Albion Camera is compact and portable.



Camera Extended.

The cut showing the Albion Camera partly folded, and the one showing the great length of platform when the extension bed is fully drawn out, really make extended comment unnecessary, but it will not do to pass by so lightly the Double Plate Holders fitted to the Albion Camera. All of the imported English holders (double backs, " you know "), warp when subjected to the severe test of our climate, and the slides refuse, without provocation, to move.

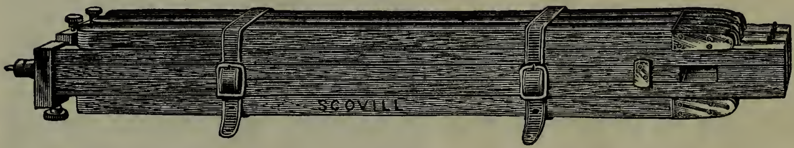
We have not or do not propose to imitate them, but fit the Albion Cameras with double holders, which we guarantee not to warp, and we put in them our patent Registering (Record) Slides.

The marked superiority of the Albion Cameras over any and all styles of English make will be more apparent on examination, or, better still, through using one of them.

CARRYING CASE.

Canvas Bag for Camera.

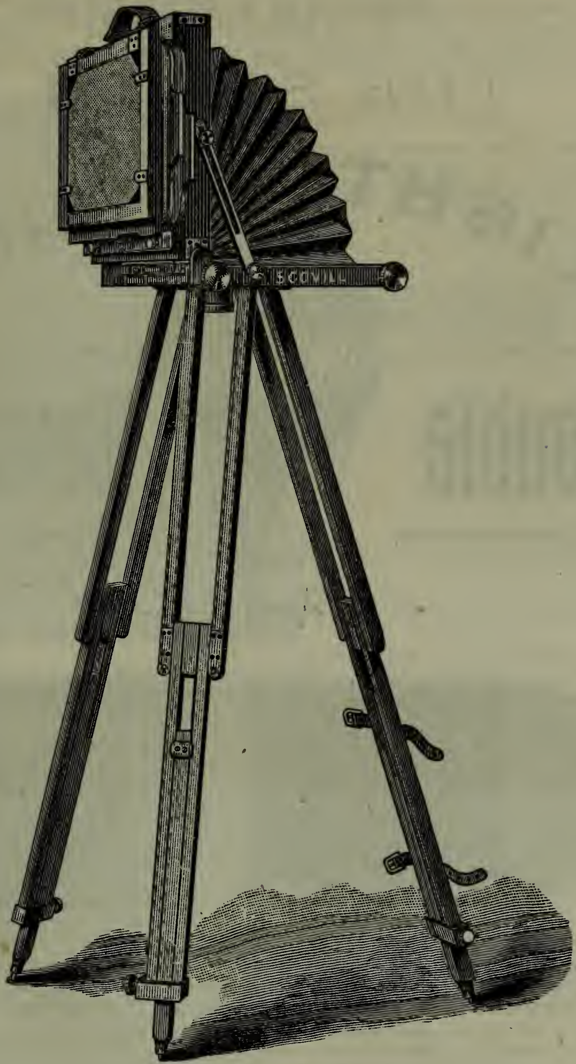
A glance at the fine carrying case provided for the Albion Camera is sufficient to convince one of its compactness. This case is lined with the best canton flannel, and has a leather partition to separate the camera from the holder.



Tripod.

Albion Tripod. While folding compactly, as here shown, the Albion Tripod is readily extended and firm enough to support, without vibration, a 10x12 view camera. The binding straps are attached to one of the legs, so that they are always there when wanted.

The Albion Camera has a double swing-back and a single swing-front, and, when used with the Shifting Front, the extreme possibility of tilting is attained. The tallest towers must come down to the ground-glass screen, which, in common with all cameras of the English pattern, is hinged so that it may throw over the top of the camera or behind the holder when that is in use.



Camera and Tripod.

PRICE-LIST OF ALBION CAMERAS.

Each with Albion Tripod and Extra Fine Canvas Carrying Case.

5 x 7	Size,	$48 00.
6½ x 8½	"	50 00.
8 x 10	"	60 00.

SCOVILL MANUFACTURING CO.,

423 BROOME STREET,

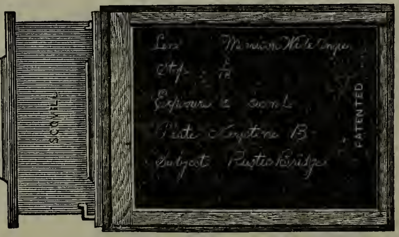
W. IRVING ADAMS, Agent. New York.

LIGHT WEIGHT HOLDERS CAN BE FITTED TO ANY AMERICAN OPTICAL CO. CAMERA OR SCOVILL OUTFIT.

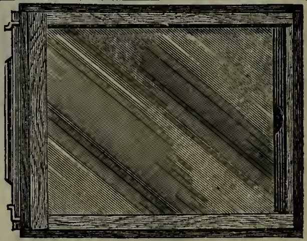
THE SCOVILL

LIGHT-WEIGHT

Double Holders.



SHOWING
PATENT REGISTERING SLIDE.



WITH FRONT SLIDE
TAKEN OUT

Substantial, serviceable and accurate double holders cannot be made smaller or lighter than the Scovill Light-weight Holders, and though so thin kits may be used in them. The Light-weight Holders yield a negative *the full width of the plate*, and, what is equally important, the plate may be placed in these holders or removed therefrom *without touching the sensitive surface* and *without danger of breaking it*. Observe the means shown in illustration for locking the slides. The Light-weight Holders are made with solid frame so that they *will not come apart, leak light, or warp*. Every holder has the *patent Registering Slides* described on the opposite page. Skilled photographers do not consider any holder complete without them. If you want to secure *accurate focusing* use the Light-weight, or any of the other Scovill Plate Holders. (PATENT APPLIED FOR.)

PRICE LIGHT-WEIGHT DOUBLE HOLDER.

3¼x4¼	$ 90	5 x7	$1 30
4 x5	1 00	5½x7	1 40
4¼x5½	1 10	5 x8	1 40
4¼x6½	1 25	6½x8½	1 70
4¾x6½	1 30	8 x10	2 00

FOR SILVERING,

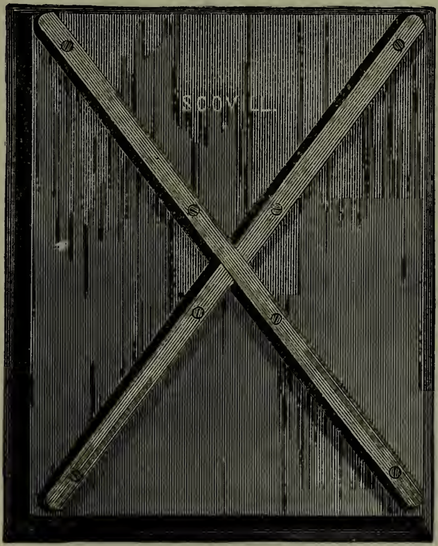
The WATERBURY Trays are the BEST and CHEAPEST.

These Trays are made by the

American Optical Co.

which of itself is a guarantee of the superiority of the wood work.

Canvas is not required for the seams, as the bottoms are seamless. The bottom rests on cross-strips—a great improvement, for steadiness, over knobs at the corners, which were liable to be broken off.



THE

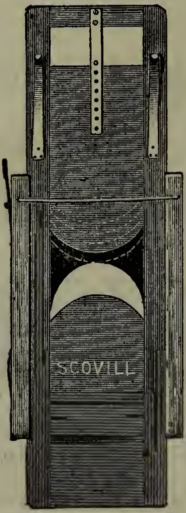
WATERBURY TRAYS

are guaranteed not to warp or crack.

PRICE LIST.

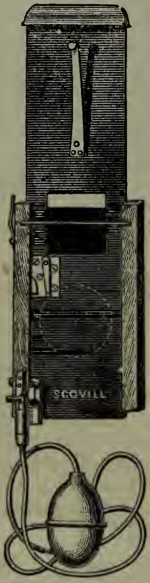
	Each.
15x19 Waterbury Trays	$3 50
19x24 " "	5 00
22x28 " "	6 50
25x30 " "	9 00

Scovill's Universal Safety Shutters.



THIS Shutter is styled Universal, not only because more of the Scovill Safety Shutters are in use than of any other pattern, but because it can be arranged with a variety of openings, from ¼ to 2 inches at the center, as shown by the dotted lines of the accompanying illustration. Uniform distribution of light over the plate is insured by the form of opening.

The brakes on this Shutter make it safe to use, by preventing a recoil with the resulting double exposure, and the jarring common to many Shutters, which in time breaks apart the glasses of a Lens where cemented together—hence the designation "Safety Shutter."



Scovill's Safety Shutter.

PRICE LIST.

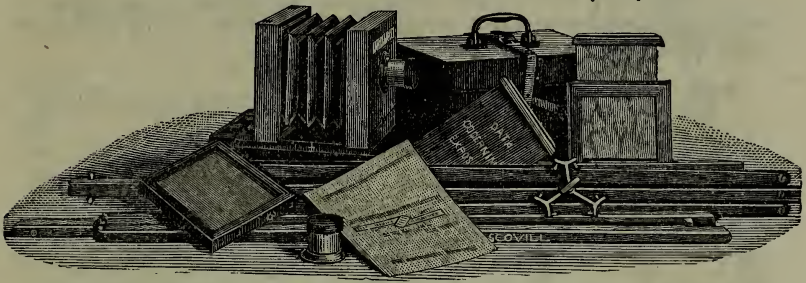
No.	Width of Opening in Slide.	Universal Shutters.	Universal Shutters with Pneumatic Release.	Safety Shutters.	Safety Shutters with Pneumatic Release.
1	1¼ inches	$2 70	$4 20	$1 20	$2 70
2	1½ "	2 80	4 30	1 30	2 80
3	1¾ "	2 90	4 40	1 40	2 90
4	2 "	3 00	4 50	1 50	3 00
5	2½ "	3 10	4 60	1 60	3 10
6	3 "	3 25	4 75	1 75	3 25

When ordering these Shutters, exact diameter of head of Lens should be given, so that the proper circular opening may be cut out to exactly fit hood of Lens. If not stated, the Shutters will be sent without the round opening being cut.

SCOVILL MANUFACTURING CO.

Scovill's Favorite Amateur Outfits.

All Articles of which are Warranted Accurate in Every Respect.



These Outfits are lighter, more compact, far handsomer and more accurate than any which are offered at the same price. Many professional photographers have bought them and use them constantly.

In each Outfit the Waterbury Lens is worth the price charged for the entire Outfit.

PRICE LIST.

4 x 5	Favorite Outfit	$10 00	5 x 8	Favorite Stereoscopic Outfit	$18 50
5 x 7	"	12 00	6½ x 8½	" Outfit	14 00
5 x 8	"	12 00	8 x 10	" "	26 00

FAVORITE OUTFITS consist of a Favorite View Camera with vertical shifting front, single swing movement, rubber bellows and folding platform, with patent latch for making bed rigid instantaneously; also, 1 Patent Double Dry Plate Holder (Reversible), with patent Registering Slides, and with Kits; 1 Taylor Improved Folding Tripod, 1 "Waterbury" Achromatic Lens with a set of stops and 1 Carrying Case.

The Improved Bonanza Plate-Holder.

Being the sole agents for the manufacture and sale of the "Bonanza Holder," patented January 19, 1875, we hereby notify all concerned that such holders made by other parties are infringements of said patent, and we will hold all dealers or others having infringing goods in their possession responsible in damages.

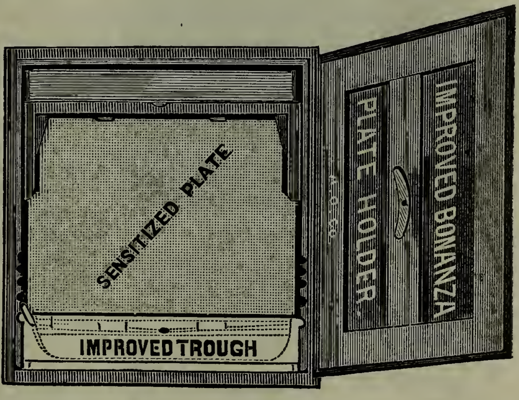
Prices as follows.

1-4	$4 25
1-2	6 40
4-4	9 60
8 x 10	10 50
10 x 12	16 00
11 x 14	21 50
14 x 17	24 00
17 x 20	27 50
20 x 24	35 75
25 x 30	44 00

For 8 x 10 Cincinnati Camera.. ... $12 75

For Multiplying Camera... ..$12 75

Fitted with Eastman-Walker Roll Holder, new model, $27 00, $36 50, $44 00.



SCOVILL MANUFACTURING CO.,

Exclusive Licensees, - - - - NEW YORK.

Scovill's Ready-Sensitized Albumen Paper

This Paper was expressly manufactured for and introduced by us to give to those who have not the skill, time, inclination or appliances to sensitize photographic paper preparatory to printing, an article of the finest quality and of uniform sensitiveness.

PRICE LIST.

Size.		Per Dozen.
4 x 5	inches, in light-tight rolls, 2 dozen	$0 20
5 x 8	" " " 2 "	37½
6½ x 8½	" " " 2 "	50
8 x 10	" " " 2 "	75
18 x 22	" " " 1 "	3 00

To save loss, Rolls are not broken

Tin Cases, to hold one dozen, 18 x 22 Sensitized Paper, 30c. each.
" " three " " " " 50c. "

S. P. C. Ferro-Prussiate Paper, FOR MAKING Blue and White Pictures.

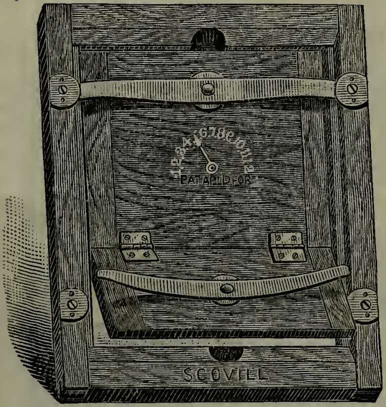
PRICE LIST.

Size.		Per Package.
4 x 5	inches, in light-tight parcels, 2 dozen	$0 28
5 x 8	" " " 2 "	50
6½ x 8½	" " " 2 "	67
8 x 10	" " " 2 "	83

To save loss, Parcels are not broken.

In full Rolls of 11 yards each, 29 inches wide, $5 00 per Roll.

Scovill Printing Frames.



Patent Applied For.

The Scovill Printing Frames are now provided, in all sizes, with the new tally, without addition to the price. Below 5 x 7 size there is room for the tally only where the backs are cut "two-thirds," as shown in the illustration.

The Scovill Printing Frames are made of cherry, and have superior brass springs constructed on scientific principles. On the flat printing frames, these springs are secured by rivets and turn on brass washers, being held at the end by buttons made so that they cannot turn around. They are constructed so that a uniform pressure is obtained, thus insuring perfect contact between the paper and the negative, and removing the danger of breaking the latter.

The back-boards are also so arranged that the progress of the printing may be watched without danger of shifting the paper.

PRICE LIST.

For Plates.	Regular Flat, or Two-thirds.	Deep.	For Plates.	Regular Flat, or Two-thirds.	Deep.
3¼ x 4¼	$0 36	$0 75	13 x 16	$2 05	$2 75
4 x 5	38	75	14 x 17	2 45	3 00
4¼ x 5½	40	75	16 x 20	4 50	4 75
4¼ x 6½	42	85	17 x 20	4 50	4 75
5 x 7	50	95	18 x 22	5 00	5 25
5 x 8	52	95	20 x 24	5 50	5 50
6½ x 8½	60	1 25	24 x 30		9 00
8 x 10	75	1 60	35 x 45		16 00
10 x 12	1 00	2 00	30 x 60*		22 00
11 x 14	2 00	2 50			

When made with backs, to open lengthways, ten per cent. is added to the foregoing prices for the respective sizes.

* Larger or special sizes made to order at short notice.

The Daisy Tripod.

Manufactured by the

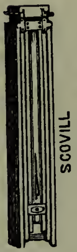
SCOVILL MFG. CO.

An inspection of one of these Tripods will convince the most skeptical that it has no superior for ease of adjustment, lightness and compactness.

Length, when folded, 16½ inches.

Weight, 2 lbs.

Price, $5.00.



THREE-CROWN ALBUMENIZED PAPER,

Used by MORA, FREDRICKS, ANDERSON, MORENO & LOPEZ, and the leading Photographers of this country.

Trade Mark DRESDEN ALBUMEN PAPER

Trade Mark DRESDEN ALBUMEN PAPER

Trade Mark DRESDEN ALBUMEN PAPER

UNDOUBTEDLY THE BEST ALBUMENIZED PAPER.

THE BEST WORKING, **DOES NOT BLISTER.**

THE ORIGINAL PENSÉ PAPER,

TRY IT ONCE. **FOR SALE BY ALL DEALERS.**

SCOVILL MANUFACTURING COMPANY, Importers.

Preserve Your Prints From Fading!

READ WHAT IS SAID ABOUT

Flandreau's S. P. C. Hypo Eliminator.

Taken from THE PHOTOGRAPHIC TIMES of June 3d, 1887.

THE NEW HYPO ELIMINATOR.

To the Editor of the PHOTOGRAPHIC TIMES.

Dear Sir: In the number of your Journal for May 6, appears an editorial article entitled "Hypo Eliminator; do they Eliminate?" in which you strongly recommend the hypochlorite of zinc for removing the last traces of hypo from silver prints.

In doing this you doubtless bring to the attention of photographers the most important improvement in print washing that has been suggested since prints were first made. There is no doubt in my mind that the worst evil pertaining to silver prints, and that for which a simple and practical remedy is most needed, is the hypo that is not eliminated from them. Now that the means for accomplishing this desirable end in an effectual and perfectly harmless manner has been pointed out, what excuse can possibly exist for its not being at once universally adopted? For one, I shall put it to use as soon as I can obtain a supply of the requisite material.

Photographers are proverbially slow in introducing changes in their practice in which the immediate advantages are not tangible or visible. But here is something decidedly tangible. By using this agent the prints may be washed in half the time, with half the water, and what is much more, so thoroughly may the work be done that not a particle of hypo or sulphur shall remain in them. Surely this is an improvement which every conscientious photographer should lose no time in putting into practice.

Not having practically tested the process I do not speak of it from actual experience, but its application is certainly theoretically correct, and it seems impossible that there can be any drawback in its use.

I trust that at the coming Convention the merits of the New Hypo Eliminator will be fully discussed.

Very respectfully,

W. H. SHERMAN.

Flandreau's S. P. C. Hypo Eliminator

— IS A —

HYPOCHLORITE OF ZINC,

Of which the Letter Speaks so Favorably.

IT IS HARMLESS! IT IS EFFECTIVE!

It Saves **TIME, PATIENCE, NEGATIVES** and **PRINTS.**

Do not prove the assertion that "PHOTOGRAPHERS ARE PROVERBIALLY SLOW IN INTRODUCING CHANGES IN THEIR PRACTICE," by delaying to procure this *"most important improvement in print-washing, which has been suggested since prints were first made."*

BUY A BOTTLE AT ONCE!

IT COSTS BUT FIFTY CENTS!

And is accompanied by a BOOK OF TEST PAPER, for detecting the slightest trace of Hypo in negative or print.

For sale by all Dealers in Photographic Requisites, and by the

Scovill Manufacturing Company.

The Old Reliable Photo. Specialties, are

Waymouth Vignette Papers,

Robinson's Trimmers and Guides,

Gihon's Opaque and Cut-outs.

WAYMOUTH'S VIGNETTE PAPERS are the best means for producing fine effects in printing. They are made in nineteen sizes; printed in black, yellow and red bronze, to suit different qualities of negatives. They are not clumsy, do not break, cost but little, and are easy of application to any negative. They do away with all the older methods; and, in fact, they have no equal. We have quantities of testimonials; but the best guarantee of their quality and work is their increasing popularity and our increased sales. Better than any patent machine, and sell better every month.

PRICES:

In parcels containing one dozen, assorted, from Nos. 1 to 5	$0 50
In parcels containing one of each size, Nos. 1 to 15, assorted colors	1 00
Assorted sizes and colors, by number, per package of 15	1 00
Nos. 1, 2, 3, 4, and 5, assorted sizes and colors, for Cartes, by number, per doz.	50
Nos. 6, 7, 11, 12 and 13, assorted sizes and colors, for large Cartes and Victorias, by number, per dozen	75
Nos. 8, 9, 10, 14, 15 and 15½, assorted sizes and colors, Cabinets and Whole-size, by number, per dozen	1 00
Nos. 16, 17 and 18, assorted sizes and colors, Half-cabinets and Whole-size, by number, per dozen	1 25

When ordering state the number and color you want.

ROBINSON'S TRIMMERS, both revolving and straight cut, are invaluable instruments, and are now universally used, as they afford a quicker, better, and less expensive means for trimming photographs than any other. They do not cut, but pinch off the waste paper, and leave the print with a neatly beveled edge, which greatly facilitates its adherence to the mount. Try one, and you will discard the knife and punch at once. For ovals and round corners they are worth their weight in gold.

A FULL LINE OF ROBINSON'S METAL GUIDES, of regular sizes, always on hand; ten cents per inch, longest way of aperture. Special sizes made to order at 15 cents per inch, longest way of aperture.

Robinson's Revolving Trimmer and Guide	**$1 00**
Robinson's Straight-cut Trimmer	**50**

GIHON'S OPAQUE is designed for completely obscuring the imperfect backgrounds of copies and faulty skies in landscapes; for retouching negatives, and coating the inside of lenses and camera boxes, and for answering all the requirements of the intelligent photographer in the production of artistic results in printing. Whenever you want to keep out light, **use Opaque.** It is applied with a brush, dries quickly, and sticks.

GIHON'S CUT-OUTS are the very best that are made, and are now without rival in the market. They are clean cut and of desirable shapes and sizes. They are made of non-actinic paper, manufactured especially for the purpose.

TEN new shapes are now made, **Ovals, Arch-tops, Circles, Crescent, Keystone, Maltese Cross, Palette,** etc. These are especially desirable. Thirty cut-outs, with corresponding masks, in a package.

Opaque	$0 50
Cut-outs, per package (30)	1 00

Parties wishing special sizes can have them cut to order by addressing the manufacturers. No lot of less than $1.00 cut at a time.

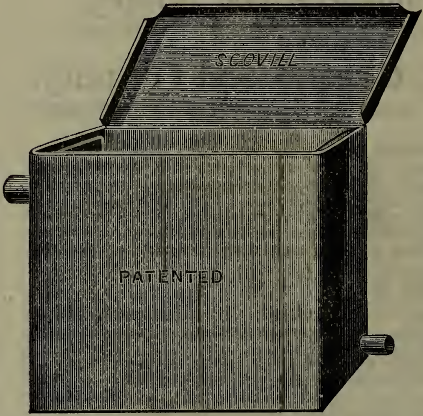
SCOVILL MANUFACTURING COMPANY,

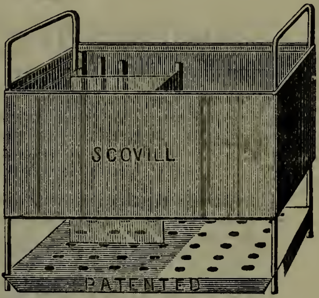
Trade Agents.

THE SCOVILL

NEGATIVE WASHING BOXES.

(PATENTED.)





The Scovill Negative Washing Boxes are now made, as shown in the above illustrations, so that plates may be taken out without putting the fingers in the washing water. The perforated bottom prevents water from passing through the box with too great force, and distributes it so that every plate and every portion of a plate is equally washed, and this cannot be done with any other washing box.

PRICE LIST.

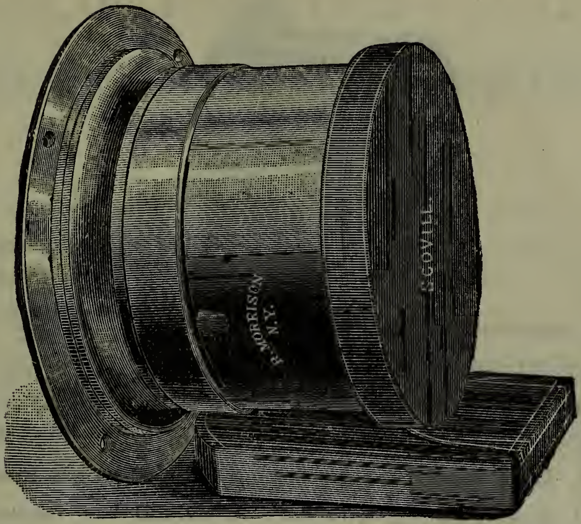
		EACH.
For 3¼ x 4¼	Plates	$1.60
“ 4 x 5	“	1.75
“ 4¼ x 5½	“	1.90
“ 4¼ x 6½	“	2.00
“ 5 x 7	“	2.10
“ 5 x 8	“	2.15
“ 6½ x 8½	“	2.25
“ 8 x 10	“	2.50
“ 10 x 12	“	3.25
“ 11 x 14	“	3.75
“ 14 x 17	“	4.80

Scovill Adaptable Negative Washing Boxes.

(PATENTED.)

		EACH.
5 x 7,	Adapted for 4x5 and 3¼x4¼ Plates	$2.70
5 x 8,	“ “ 4x5 and 3¼x4¼ Plates	2.75
6½ x 8½,	“ “ 5x8, 5x7, 4x5 and 3¼x4¼ Plates	3.00
8 x 10,	“ “ 6½x8½, 5x8, 5x7, 4x5 and 3¼x4¼ Plates	3.50
10 x 12,	“ “ 8x10, 6½x8½, 5x8, 5x7, 4x5 and 3¼x4¼ Plates	4.00
11 x 14,	“ “ 8x10, 6½x8½, 5x8, 5x7, 4x5 and 3¼x4¼ Plates	4.50

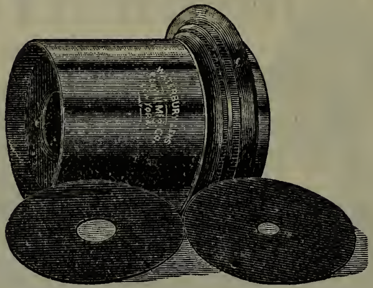
THE LEUKOSCOPE LENSES.



The name given to the Lenses introduced by Mr. Richard Morrison is singularly appropriate ; Leukoscope indicating a *brilliant light.* These lenses work with greater rapidity than any of the so-called rapid lenses, and possess a depth of focus truly remarkable. By their agency portraits having life-size heads may be taken with sharpness and delicacy. The construction is such as to ensure equal illumination all over the plate, which cannot be effected by any lens set in a long tube and worked with full aperture. When used with a medium diaphragm they will take an instantaneous group out of doors, every figure being sharp. For copying they are unexcelled.

No.	Diameter.	Size of Group.	Size of Landscape.	Back Focus.	Equiv. Focus.	Price.
1	4 inches	18x22	25x30	32 inches	34 inches	$180 00
2	4 "	17x20	20x24	25 "	26 "	170 00
3	3½ "	16x18	17x20	21 "	22 "	150 00
4	3 "	11x14	14x17	18 "	19 "	100 00
5	3 "	8x10	11x14	15 "	16 "	80 00
6	3 "	6x 8	8x10	12 "	13 "	60 00

WATERBURY LENSES.



The unprecedented success which has everywhere resulted from the employment of the smaller Waterbury Lenses—those for 4 x 5 and 5 x 8 respectively (and which are achromatic combinations composed of a bi-convex Lens of crown glass cemented to a plano-convex Lens made of the best flint glass)—has induced the Scovill Manufacturing Company to extend the capabilities of this favorite objective, and to issue one of larger dimensions and longer focus than either of the others.

This new lens, which is designated "The 'C' Waterbury Lens," possesses all the excellent qualities of those of smaller size, while it takes a negative of greatly increased dimensions. It produces a negative on an 8 x 10 plate with great perfection, although some photographers do not hesitate to use it on a 10 x 12 plate. The lens is constructed of the finest optical glass, and has a diameter of 2¼ inches, its focus being 15 inches. When the largest stop is employed this lens is capable of producing fine portraits—especially busts—on a twelve-inch plate.

It has diaphragms of three different diameters, these being carefully calculated so as to suit the various exigencies under which a lens is employed.

PRICE.

A, Single, for 4 x 5 plate	$3 50
A, Matched pair, stereoscopic	7 00
B, Single, for 5 x 8 plate	4 50
BB, Single, for 6½ x 8½ plate	6 00
C, Single, for 10 x 12 and 8 x 10 plate	8 00

MORRISON'S

INSTANTANEOUS

Wide-Angle View Lenses.

With full opening, these Lenses have all the extreme depth for which the Morrison Regular Wide-Angle Lenses are noted. They work with extreme rapidity, and will cover an angle of 90 degrees sharp. Furnished with a set of diaphragms.

Diameter of Lens.	Size of Plate, Full Opening.	Size of Plate when Stopped Down.	Focus.	Price.
⅞ inch.	4x 4 inches.	5x 7 inches.	6 inches.	$30 00
1 "	4x 5 "	8x10 "	8 "	35 00
1¼ "	5x 8 "	10x12 "	10 "	40 00
1⅜ "	8x10 "	14x17 "	12 "	45 00

Morrison Combination Wide-Angle Lens.

Opening the velvet-lined morocco case containing this lens you will find partitioned-off space containing an ordinary 5-inch Morrison Wide-Angle Lens, on which the front and back combinations are distinctly marked with the figure 5.

Besides this, in cells, are four mountings with lenses of varying focal lengths, each marked in white with a number. By unscrewing the back combination marked 5, and putting in its place the mounting marked 6, a lens of 6-inch back focus is obtained.

Again, by removing both these cells and replacing them with the two marked 8, a lens of 8-inch back focus is the result.

By screwing in the front combination marked 5 and the back combination marked 4, a lens of 4-inch back focus is obtained.

Putting a front combination marked 8 and a back marked 6, a focus of 7 inches is produced.

Thus the operator has a choice of five focal lengths with the one lens.

Price for Morrison Combination Wide-Angle Lens, $80.00.

MORRISON'S

"FULL FIGURE"

8x10

PORTRAIT LENS.

Price, $90.00.

Send for Descriptive Circular.

THE

Wale Universal Lenses

FOR

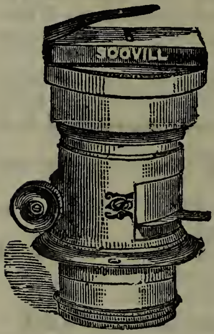
LANDSCAPES, GROUPS, PORTRAITS,

And Instantaneous Views.

6 in.	back	focus,	for	6½ x 8½	Plates	and under (without Shutter)..	$25 00
6 "	"	"	"	6½ x 8½	"	" { with Instantaneous and Time Shutter, }	35 00
10 "	"	"	"	8 x 10	"	" (without Shutter)	40 00
10 "	"	"	"	8 x 10	"	" { with Instantaneous and Time Shutter, }	50 00

For Sale by all Dealers, and by the Agents.

SCOVILL MANUFACTURING CO.



EXTRA RAPID

"Peerless" Lenses.

Size, ½ ; Rack and Pinion ; diameter, 2⅝ inch ; back focus, 6½ inch ; price	$60 00
Size, 4-4 ; rigid mounting ; diameter, 3⅛ inch ; back focus, 8 inch ; price	85 00
Size, ex., 4-4 ; rigid mounting ; diameter, 4 inch ; back focus, 12 inch ; price	160 00

These lenses work with an aperture the full size of the lens, and, being short focus, are very rapid. They give perfect definition, with great depth of focus.

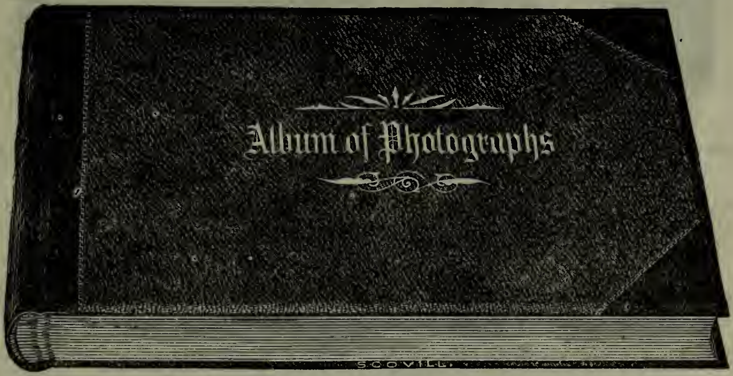
Morrison's Wide-Angle View Lenses.

Patented May 21, 1872.

These Lenses are absolutely rectilinear; they embrace an angle of fully 100 degrees, and are the most rapid, and are universally conceded to be the best *wide-angle* lenses made.

No.	Diameter of Lens.	Size of Plate.	Equivalent Focus.	Price.	
1	¾ inch	3¼ x 4¼ inch	3 inch, each,	$25 00	These 5 sizes will fit into 1 flange.
2	1 “	4 x 5 “	3½ “ “	25 00	
3	1 “	4½ x 7½ “	4¼ “ “	25 00	
4	1 “	5 x 8 “	5¼ “ “	25 00	
5	1 “	6½ x 8½ “	6½ “ “	25 00	
6	1 “	8 x 10 “	8 “ “	30 00	
7	1¼ “	11 x 14 “	10½ “ “	40 00	These 2 sizes will fit into 1 flange.
8	1¼ “	14 x 17 “	14 “ “	50 00	
9	1½ “	17 x 20 “	17 “ “	60 00	These 3 sizes will fit into 1 flange.
10	1½ “	20 x 24 “	22 “ “	80 00	
11	1½ “	25 x 30 “	28 “ “	100 00	

☞ Nos. 1 to 6 are all made in matched pairs for stereoscopic work. The shorter focused Lenses are especially adapted for street and other views in confined situations. For general purposes, a pair of No. 5 Lenses will be found most useful.



PRICE LIST OF

Scovill's Albums FOR Photographs.

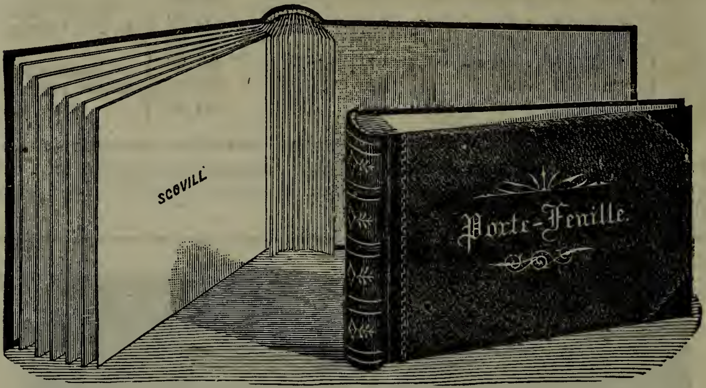
For Photo. (size)	4x5	5x8	6½x8½	8x10	11x14
Size of Card	6x7	7x10	10x12	11x14	14x17
Plain	$1.15	1.40	2.00	2.25	4.50
With Prepared Surface	1.35	1.75	2.75	3.00	
With Gilt Lines	1.65	1.90	2.50	2.75	

Each Album has 48 pages, 24 leaves. In them the finest card-board only is used, chemically free from anything that could injure a print.

The Scovill Porte-Feuille

Is a device for the preservation, in convenient form, of cards upon which photographic prints have been mounted A series of muslin holders, bound between covers with patent flexible backs, constitute a book having great strength of binding, combined with a flexibility that allows the book to be opened flat without strain. Prints can thus be put into book form, readily and securely, AFTER they have been mounted and also (when desired) burnished. The insertion of the cards is very simple, as will be seen by the directions which follow: To the inner faces of one of the holders apply enough paste to attach the card securely; not so much as will smear the exposed face of the card; then insert the card and rub down on both sides; allow the paste to dry before putting in another card.

Do not put the Paste on the Card.



Price List of Porte-Feuille, including 25 Sheets of Collins' Best Quality White Cards.

No. 1.	Outside dimensions,	7x10,	for 5 x 8 Photographs,	$1 45
" 2.	" "	10x12,	for 6½x 8½ "	2 00
" 3.	" "	11x14,	for 8 x10 "	2 40

Price List of Porte-Feuille, including 25 Sheets of Collins' White Muslin Back Cards.

No. 4.	Outside dimensions,	7x10,	for 5 x 8 Photographs,	$1 30
" 5.	" "	10x12,	for 6¼x 8½ "	1 90
" 6.	" "	11x14,	for 8 x10 "	2 30

Price List of Cards per package of 25, not including Porte-Feuille.

COLLINS' BEST WHITE CARDS.

7x10	$0 45	10x12	$0 70	11x14	$0 88

COLLINS' WHITE MUSLIN-BACK CARDS.

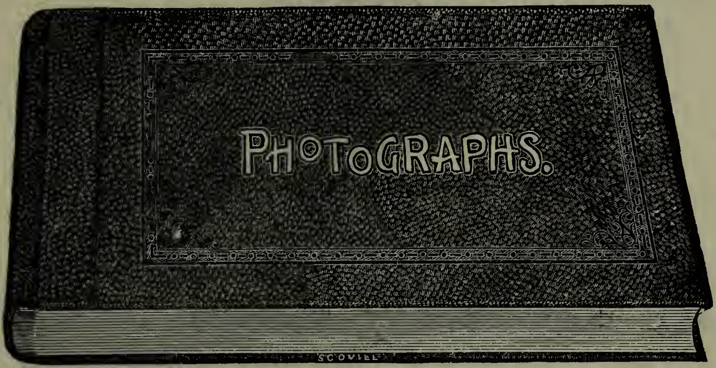
7x10	$0 30	10x12	$0 60	11x14	$0 80

Collins' White Muslin-Back Cards, in Rolls, 22 Inches Wide, 14 Cents per Yard.

HOWARD ALBUMS,

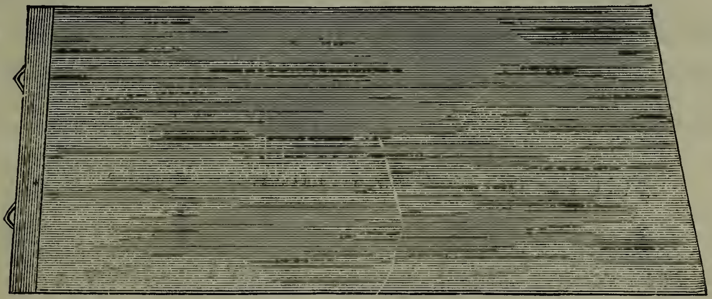
FOR PHOTOGRAPHS.

THE Howard Album, with interchangeable cards, is the latest novelty in the way of an album for mounting photographs. In handsomely embossed covers, are bound 24 of Collins' cards, which are chemically pure from all matter that would injure the photographs. In the mode of binding, and their interchangeable feature, lies the difference between this and other albums.



To each card are attached two small metallic binding loops, so fastened that they act like hinges ; through the projection of these loops a binding cord passes, which fastens at the back with a tie ; thus each card is bound in the cover independently, and may be taken out and returned or replaced with ease. This method of making an album affords the amateur the best means of preserving the results of his labor, because each picture may be finished before putting the card in the album. The arrangement of the pictures may also be altered at will—if a single card is spoiled the whole album is not ruined. If a picture is taken out, it can be quickly and readily done without injury to the volume.

These albums are also eminently suited for mounting foreign views, on account of the cards not working like ordinary scrap books, the album opening perfectly flat, and having the admirable interchangeable feature.



SIZES AND PRICES,

No. 1, 6x7	Cards, for	4x5	Photographs.	$1.10
No. 2, 7x10	" "	5x8	"	1.35
No. 2½, 8x10	" "	6½x8½	"	2.00
No. 3, 8x12	Cards, for	6½x8½	Photographs,	$1.90
No. 4, 11x14	" "	8 x10	"	2.35

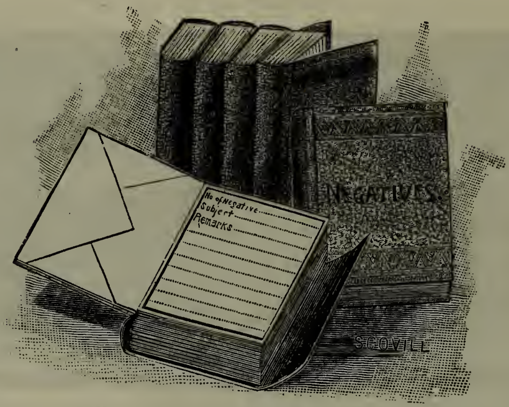
EXTRA CARDS (Collins' Best) for Howard Albums, Mounted with Loops, Ready for Use.

6x7,	Package of one dozen, - - -	$0.38
7x10,	" " " - - - - -	.50
8x12,	Package of one dozen, - - - -	$0 62
11x14,	" " " - - - - - -	.88

SCOVILL MANUFACTURING COMPANY.

THE HOWARD

Negative Preserver and Binder.



These convenient Binders consist of heavy, finely surfaced envelopes (Negative Preservers), secured in cloth covers, and printed for reference, as shown in cut, and are designed for the preservation and classification of either paper or glass negatives, or mounted or unmounted photographs.

The Howard Binders occupy much less space than negative boxes. By means of the patent adjustable back, the file enlarges as the envelopes are filled, and when full present the appearance of a handsome volume suitable for the library.

The Binders are all made with front flap and tie.

No. 1, for 4¼x5½, 4x5, and 3¼x4¼ negatives or prints	$0 50
No. 2, for 5x8, 5x7, 4¼x6½ negatives or prints	60
No 3, for 6½x8½ negatives or prints	75
No. 4, for 8x10 negatives or prints	1 00

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